United States Patent

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[54] **DETACHABLY CONNECTED ARCHERY BOW LIMBS WITH ENGAGING BODY MEMBERS**
12 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **124/24**
[51] **Int. Cl.** **F41b 5/00**
[50] **Field of Search** 124/23, 24, 25, 22, 21, 30, 41

[56] **References Cited**

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2,457,793	12/1948	Bear	124/23
3,156,230	11/1964	Groves	124/24
3,326,200	6/1967	Grable	124/24

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ABSTRACT: A two-piece archery bow having a pair of bow limbs disposed in an end-to-end relationship and joined together by a coupling member rigidly secured to each limb. The coupling members include alternating grooves and ribs with complementary configurations to engage each other. A mounting bolt is inserted in a bore extending through both members when they are aligned with each other to maintain the members and the limbs in alignment and prevent any movement between them. A pivot pin is provided through the coupling members to permit pivoting of the bow limbs with respect to each other when the mounting bolt has been removed.

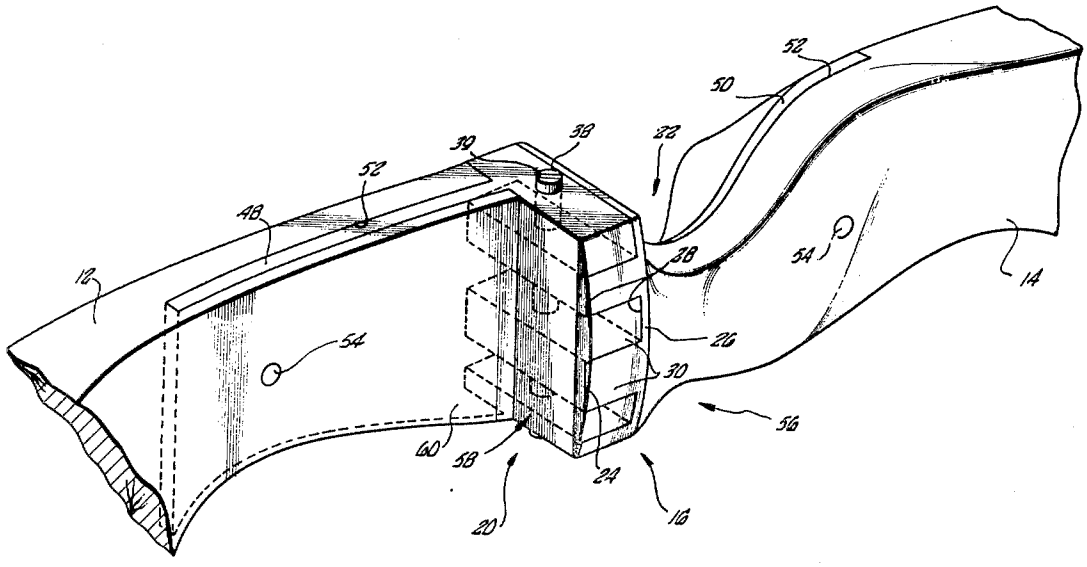


FIG. 1

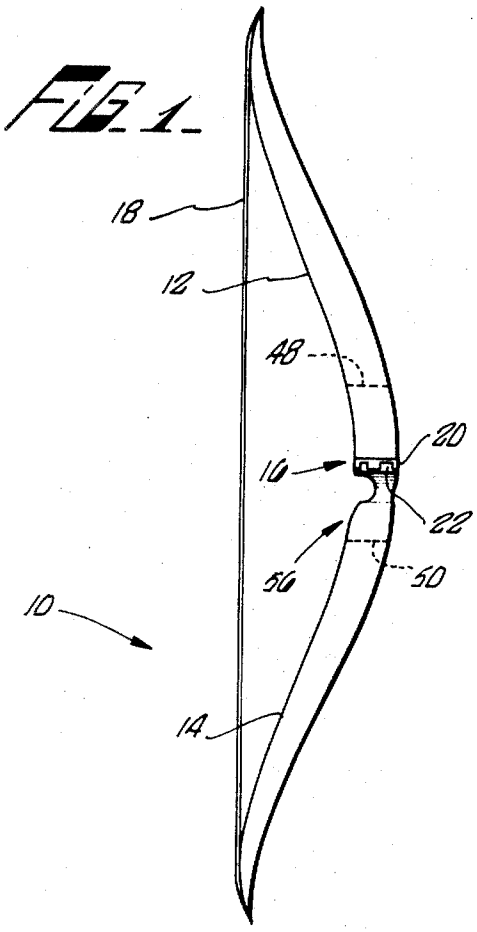


FIG. 2

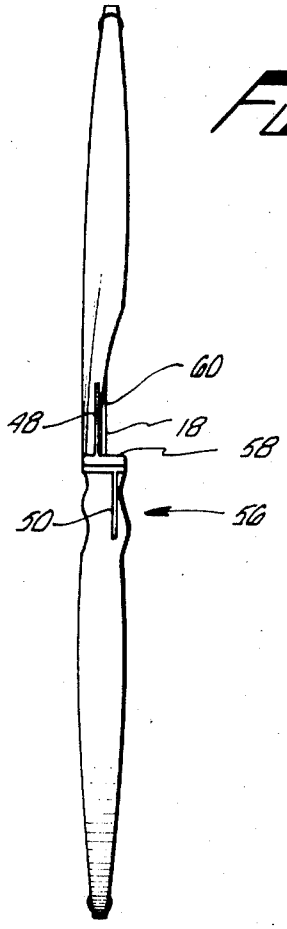


FIG. 5

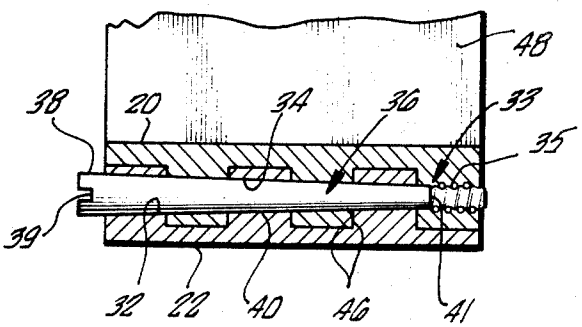
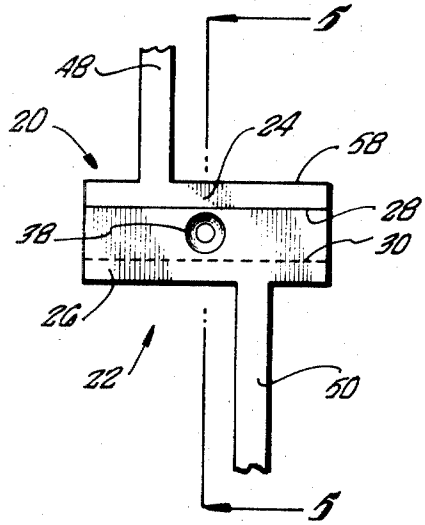


FIG. 4



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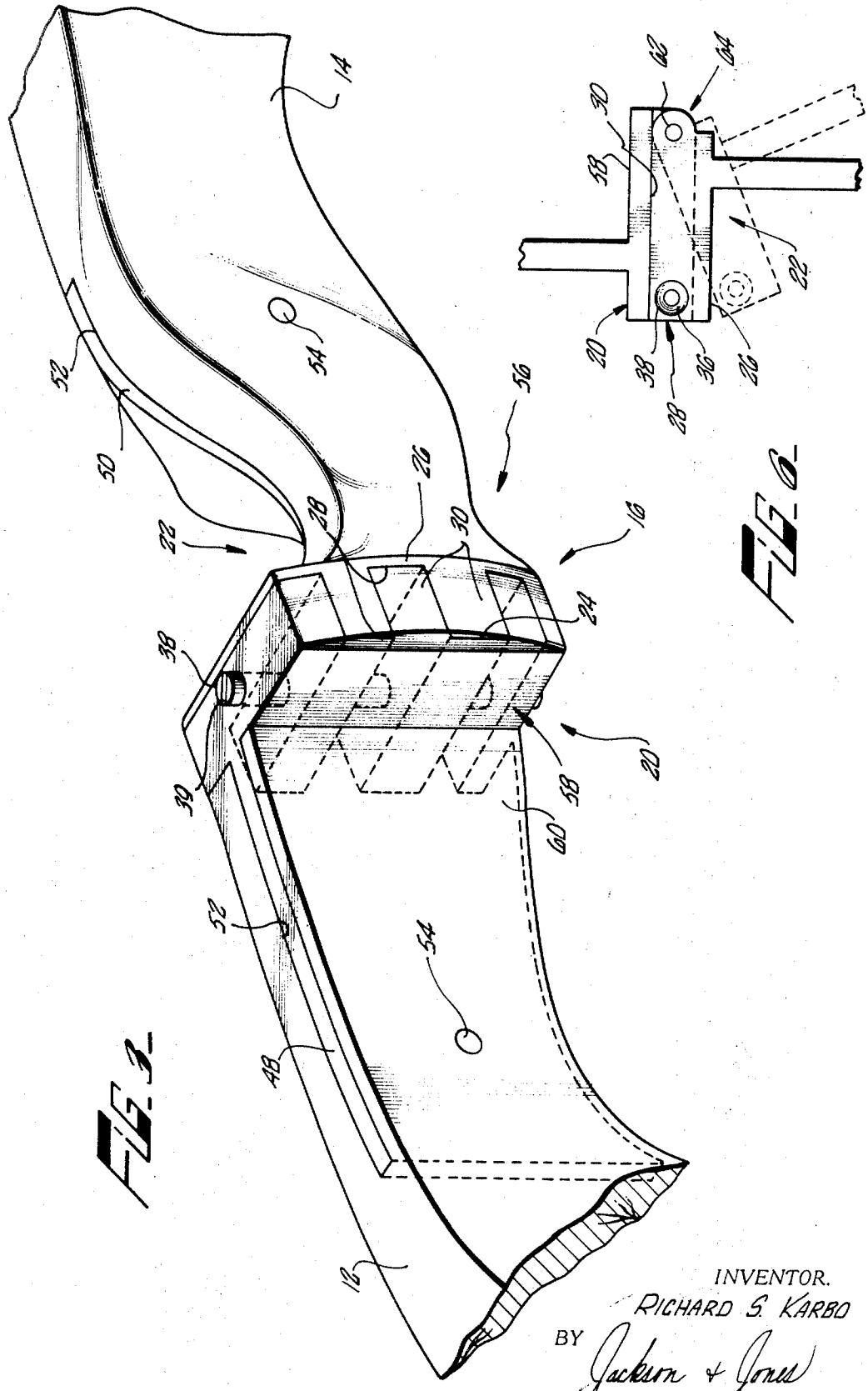

FIG 2

FIG 3

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DETACHABLY CONNECTED ARCHERY BOW LIMBS WITH ENGAGING BODY MEMBERS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to two-piece demountable or, as they are more commonly known, take-down archery bows and more particularly to a take-down bow having coupling members in snug engagement with each other to prevent any relative movement between them.

2. State of the Prior Art

Archery bows, particularly those used for hunting game, have lengths which frequently equal the height of the archer. They are therefore relatively awkward and cumbersome to carry and transport. To facilitate their handling, archery bows have in the past been built in two or more pieces which could be assembled and disassembled. While disassembled, the pieces are relatively short and easy to transport. At the location of their intended use they are reassembled to provide a full length archery bow.

Bows of this size, ranging in length up to five or six feet or more, must be strongly built since they require a drawing force of up to about 50 or 60 pounds. Particularly the center section of the bow, where the parting line would be most ideally placed to enable the bow to be taken down into pieces of equal length, experiences maximum bending moments and must therefore be the strongest part of the bow. Failure to make the bow sufficiently strong may cause its breakage and additionally injure the archer.

As a consequence most prior art take-down bows provide a centrally located and separate handle portion which is joined to two limb members. In many of such bows the middle handle portion operates as a sleeve joint and receives each of the limb members in a telescopic fashion. The central handle portions may be constructed of metal or similar high strength material to withstand the relatively large bending moments.

These three-piece bows have not been fully satisfactory. During transportation the archer must carry with him three separate pieces, ordinarily of different lengths and cumbersome to handle. Furthermore, the bows are expensive to manufacture since the required two joints must be accurately machined to insure satisfactory service. Also the bow limbs tend to creak during use. Such creaking is distracting to the archer and may affect the accuracy of his shot.

More recently, and as illustrated in U.S. Pat. No. 3,516,230 issued November 10, 1964, an attempt has been made to construct a take-down bow with only one joint, thereby eliminating the previously necessary center portion and second joint. Briefly, a bow constructed in accordance with that shown in the referred to patent is no more than a unitary single piece bow which has been cut adjacent its center line, thereby yielding two similar halves. The cut is angularly inclined, a pair of positioning pins and mating holes assure alignment of the bow when assembled, and a threaded bolt secures the halves to each other.

Although this bow has eliminated some of the shortcomings of the earlier prior art, its construction does not lend itself well for use on large bows. The mating surfaces of the halves are constructed of the same material as the remainder of the bow, most commonly ordinary wood. Although the surfaces are precision machined, atmospheric conditions, particularly temperature and humidity, cause a steady working of them. The surfaces might cease to mate properly, thereby preventing a secure and rigid connection between the two halves. The single bolt engages portions of the bow and under large forces may strip the threads or pull metal inserts from the wood. In addition, during its use the bow may exhibit a substantial amount of creaking.

SUMMARY OF THE INVENTION

Briefly, a take-down archery bow constructed in accordance with the present invention includes a pair of similar bow limbs and a coupling member rigidly and immovably secured to an end of each limb. A first member has a groove arranged transversely to the bow limb and a first aperture, the projection of which intersects the groove. A second coupling member has a configuration complementary to that of the first and at least one rib projecting into the groove. The rib has a configuration to nest snugly in the groove. A second aperture in the rib is arranged and oriented to be coaxial with the first aperture when the coupling members are in mutual engagement with each other. Releasable bolting means in the apertures retain the coupling members in their mutual engagement such that the bow limbs extend away from the members in opposing directions.

Preferably, the members include elongated legs which extend in a direction opposite the direction in which the ribs extend. The legs are secured to end portions of the bow limb. Preferably, they are embedded in the limb and bonded thereto.

The bolting means preferably includes a tapered pin threaded on one end and having a slot at the other end. The apertures are tapered such that they define a smooth, tapered hole when coaxial with each other into which the pin is placed and screwed into one end of a coupling member. As the pin is tightened it draws the members into mutual alignment by accurately aligning the first and second apertures. The tapered hole and pin provide an engagement between the two coupling members which is rigid and immovable. The bow limbs are therefore releasably engaged with each other as though they were constructed of one piece.

At the same time the bow can be taken apart into two relatively short pieces by simply removing the pin from the hole. No special tools are required and the operation is quickly performed in the field.

While the bow is assembled, the snug interengagement between the grooves and the ribs together with the accurately fitting tapered pin and hole maintain the two halves of the bow immovable relative to each other and permit the coupling members to absorb high forces and bending moments. By orienting the ribs and the grooves such that their axes are transverse to the direction the bow is drawn and by maintaining a snug fit between them, most of the bending moment is transmitted through the ribs. The pin can be maintained relatively small while the strength of the joint is large. The coupling members are therefore ideally suited for use on large size bows and particularly on large size hunting bows. The possibility of breakage is, for all practical purposes, eliminated. Distracting creaking sounds emitted by prior art multi-piece bows are eliminated by virtue of the rigidity of the joint which permits no relative sound producing movements between the members.

The coupling members are constructed of prefabricated material, preferably metal extrusions, which can be conveniently and inexpensively machined without the added bulkiness of the bow limbs extending therefrom. After the members have been machined they are secured to the bow limb and the bow is ready to be assembled. Manufacturing tolerances of the coupling members can be maintained at a minimum to add to the accuracy of the joint and to its rigidity. The heretofore experienced changes in the configuration of the joints when they are constructed of wood and which has made prior art bows susceptible to atmospheric conditions, has been eliminated.

In another embodiment the coupling members are pivotally joined together by a hinge pin. The halves of the bow are assembled by inserting the threaded pin in a tapered aperture. To take it down, however, the pin is removed and the two halves are pivoted about the hinge pin into a substantially parallel and adjacent position. The bow is conveniently carried while the two parts remain connected with each other and can be conveniently handled as a single piece.

A take-down bow constructed in accordance with the present invention therefore not only provides a more economically manufactured bow but, in addition, one that is substantially more satisfactory in service.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a two-piece take-down bow constructed in accordance with the present invention;

FIG. 2 is a front elevational view of the bow shown in FIG. 1;

FIG. 3 is a fragmentary, enlarged perspective view of the center section of the bow shown in FIG. 1;

FIG. 4 is a fragmentary detail of the coupling members joining the bow limbs;

FIG. 5 is a fragmentary sectional view taken along line 5—5 of FIG. 4; and

FIG. 6 is a view similar to FIG. 4 showing another embodiment of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIGS. 1 and 2, a take-down bow **10** includes a pair of bow limbs **12** and **14** which are releasably joined together by a coupling **16** disposed in the center of the bow. The bow limbs are conventionally shaped to provide the desired draw force when a string **18** is pulled away from the bow to propel an arrow (not shown) with the desired force.

The bow limbs may be constructed of high grade wood laminations, of a wood and fiberglass combination, or of fiberglass alone, all in accordance with the prior art.

Referring to FIG. 3, the coupling **16** is constructed of first and second coupling members **20** and **22**. Each coupling member **20** and **22** has a body **24** and **26**, respectively, which includes a plurality of ribs **28**. They project in a direction away from the bow limb to which the coupling member is secured. The ribs have a preferably rectangular cross-section, which is to be understood to include a square cross-section. Their axes extend in a direction transverse to the plane in which the archer draws the bow to propel an arrow (See FIG. 1). Each member, therefore, defines a plurality of grooves **30** which are parallel to the ribs **28** and which have a configuration complementary to that of opposing ribs from the opposite member. The two members are brought together into mutual engagement by aligning the ribs of one of the members with the grooves of the other. The grooves and ribs are constructed to snugly engage each other and, while in mutual engagement, permit only minimal relative movements between the two members.

Referring to FIGS. 4 and 5, each coupling member **20** and **22** includes an aperture **32** and **34**, respectively. Their axes are transverse to the ribs **28** and they intersect the grooves **30** at preferably right angles. The apertures are arranged and positioned to be coaxial when the coupling members are aligned with each other and no portion of them projects past an outline of the other member. The apertures are preferably tapered such that when they are coaxial with each other they define a smooth tapered hole **36** into which a pin **38** having a tapered portion **40** and a threaded portion **41** can be inserted. The last aperture **33** of the member **20** is provided with a permanently anchored steel coil spring **35** which is formed to accept the threaded end of the pin **38**.

The pin **38** defines a slot **39** on the end remote from the threaded portion. A coin may be conveniently inserted into the slot **39** to turn the pin and draw the members **20** and **22** into alignment with each other. The tapered hole **36** and the ribs and grooves **28** and **30** are arranged such that each rib **28** is fully inserted in an opposite groove **30** and substantially bottoms in that groove. The snug engagement of the ribs and the grooves, their bottoming in the grooves, and the tapered pin substantially rigidly secure the members to each other.

Pivotal movements about the axes of the bolt are prevented by the ribs bottoming in the grooves. Movement of the members in opposing directions parallel to the bow limbs **12** and **14** are prevented by the snug and "no tolerance" engagement between the tapered hole **36** and the tapered portion **40** of the pin **38**. Pivotal movements between the members about the axis transverse to the axis of hole **36** under the archer's drawing force are prevented by both the pin **38** and the snug engagement of adjacent sides **46** of the ribs **28**. Thus, the coupling **16** is substantially rigid and immovably secures the first and second members **20** and **22** to each other.

Referring to FIG. 3, a leg **48** and a leg **50** are integrally constructed with the respective bodies **24** and **26** of the first and second coupling members **20** and **22**. The legs are oriented transversely to the orientation of the ribs **28** of each member. They extend away from the respective body in opposite directions from the ribs. The legs have an outline which corresponds to the outline of the bow limb **12** or **14** to which they are secured. In a preferred embodiment of this invention each bow limb is provided with a deep slot **52** which has a width slightly greater than the width of the legs **48** and **50** such that the legs can be disposed therein. The legs are permanently and immovably secured to the adjacent bow limb in the slot **52** by preferably bonding them thereto with a suitable bonding agent such as an epoxy resin, for example. In addition one or more fasteners, such as rivets **54**, can be provided which extend through both the bow limbs and the leg of the coupling member.

Referring to FIGS. 1 through 3, the bow limb **14** includes a gripping portion **56** which has a configuration enhancing the ease and comfort with which the archer's hand can grasp it and hold the bow. The bow limb **12** is narrowed adjacent the coupling member **20**, as best seen in FIGS. 2 and 3, in the direction in which arrows (not shown) are propelled by the bow. The member **20** thereby defines a flat bow supporting surface **58** adjacent a transverse bow guiding surface **60** defined by the limb. The supporting surface extends from a side of the coupling member past its center such that string **18** adjacent the coupling **16** is disposed within a free sight area defined by both the supporting surface **58** and the guiding surface **60**. The archer can place an arrow on the supporting surface in contact with the guiding surface in line with the string **18** and the direction in which it is drawn. Undesired deflections of the arrow's path caused by its misalignment with the string and the direction it is drawn, are thereby avoided.

The take-down bow **10** is used in the following manner. It is generally stored while disassembled, that is, while pin **38** is removed from tapered hole **36** and the coupling members **20** and **22** are disengaged from each other. In this position the bow is also transported and carried into the field.

In the field the archer readies the bow for its use by aligning the ribs **28** of one coupling member with the opposing grooves **30** in the other member and moving them relative to each other into substantial alignment. Thereafter he places the pin **38** in the tapered hole **36** which, at that time may consist of a plurality of misaligned apertures **32** and **34**. Insertion of the pin, however, brings the apertures into substantial alignment with each other. Thereafter, the pin **38** is turned to engage the threaded coil **35** and secure the coupling members together. The string **18** is now conventionally connected with the free ends of the bow and the bow is ready for use.

To use it the archer holds the bow at its gripping portion **56**, places an arrow (not shown) on to the flat supporting surface **58** adjacent the guiding surface **60**. He then engages an end of the bow with the string **18**, draws the string and the bow in a direction opposite to the direction in which the ribs **28** extend, and releases both the arrow and the string, thereby propelling the arrow in a forward direction. The flat supporting surface **58** protects the archer's hand from being injured by the arrow moving at high speeds. After its use the bow **10** is taken down by reversing the just described steps for assembling it.

To assure the snug fit between the ribs **28**, the grooves **30** and the coupling members **20** and **22** irrespective of atmospheric conditions such as temperature or relative humidity, the members are preferably constructed of a corrosion resistant metal such as aluminum. Alternatively, they may be constructed of reinforced plastic material the dimensional stability of which is not affected by temperature or moisture, provided the material has sufficient strength to withstand the bending moments acting on it when the bow is being used.

Referring to FIG. 6, an alternative embodiment of the present invention includes a suitable hinge pin **62** which has

an axis perpendicular to the axes of the ribs **28** and the grooves **30**. The hinge pin is disposed in an aperture extending through all ribs and is permanently secured to both coupling members **20** and **22**. It is positioned to permit a pivotal movement of the members through an arc of about 180° from a position wherein the ribs are engaged by the opposing grooves into a position (not shown) wherein the bow limbs are in a substantially parallel, side-by-side position. An intermediate position is shown in phantom lines in FIG. **6**. The tapered hole **36** is disposed adjacent a side of the members opposite from the side mounting the hinge pin. An end **64** of the ribs **28** and the body **26** of member **22** adjacent the hinge pin is rounded to enable the relative movement of the coupling members about pin **62**.

During use of the bow a threaded pin **38** is disposed in the aperture **36**. It is removed therefrom while the bow is carried or otherwise transported to enable the bow limbs to be brought together. This embodiment is particularly useful since the bow remains essentially one piece during its transportation. Separate and loose pieces which must be carried and held together are thereby eliminated.

I claim:

1. A two-piece bow comprising:

a. a pair of similar bow limbs longitudinally disposed in an end-to-end relationship having a bow-string interconnecting the outer extremities thereof, said bow limbs and bow-string being oriented to define a plane;

b. a first coupling member rigidly and immovably secured to an end of one bow limb, having a groove arranged transversely to said defined plane defining a first aperture the projection of which intersects the groove, and a second coupling member rigidly and immovably secured to an end of the other bow limb and having a configuration complementary to that of the first coupling member and at least one rib transverse to said defined plane projecting in a direction away from the second coupling member, the rib having a configuration to rest snugly in the groove of the first coupling member, and defining a second aperture in the rib arranged and oriented to be coaxial with the first aperture when the coupling members are in mutual engagement, said groove and rib having engaging faces transverse to said defined plane; and

c. releasable bolting means disposed through the apertures for retaining the coupling members in their mutual engagement such that the bow limbs extend away from the coupling members in opposing directions.

2. Apparatus according to claim **1** wherein the coupling members are constructed of a metal and each member includes a leg projecting in the direction of the adjacent bow limb, which leg is embedded in the bow limb and immovably secured thereto.

3. Apparatus according to claim **2** wherein the coupling members are bonded to the respective bow limbs.

4. Apparatus according to claim **1** including a plurality of grooves and a like plurality of ribs on the respective coupling members, the grooves and the ribs having rectangular cross-sections with longitudinal axes transverse to the direction in which the bow is drawn in normal use.

5. Apparatus according to claim **4** wherein the apertures are tapered such that they form a smooth and continuous tapered hole extending through at least a majority of the ribs, and wherein the bolting means include a pin having a tapered portion for engaging the tapered hole.

6. Apparatus according to claim **1** wherein the groove and the rib have a rectangular cross-section and their longitudinal axes are transverse to the direction in which the bow is drawn in normal use, and wherein apertures are spaced from the first and second apertures and disposed adjacent one side of the engaged coupling members, and including a hinge pin disposed in said apertures extending through the coupling members adjacent the said one side of the engaged coupling members so that the bow limbs can be pivoted about the hinge pin into a substantially parallel, side-by-side position upon release of the bolting means.

7. Apparatus according to claim **1** wherein one of the bow limbs defines a hand gripping portion adjacent its associated coupling member, said coupling members together define a flat support surface for supporting an arrow to be propelled by the bow to prevent it from contacting the operator's hand while the arrow is so propelled.

8. A two-piece bow comprising:

a. a pair of bow limbs longitudinally disposed in an end-to-end relationship having a bow-string interconnecting the outer extremities thereof, said bow limbs and bow-string being oriented to define a plane;

b. a first coupling member defining a body rigidly and immovably secured to a leg which is attached to one of said bow limbs, the body further defining a plurality of parallel ribs and grooves on the other end thereof, and a first series of aligned apertures extending transversely through the ribs and intersecting the grooves;

c. a second coupling member defining a second body rigidly and immovably secured to a leg which is attached to the other said bow limb, the body further defining a plurality of parallel ribs and grooves on the other end thereof, the ribs and grooves having a configuration complementary to the ribs and grooves of the first body and a second series of aligned apertures extending transversely through the ribs of the second body coaxially with the first series of aligned apertures when the bodies are matingly engaged; said plurality of grooves and ribs having engaging faces transverse to said defined plane; and

d. releasable bolting means disposed through said first and second series of aligned apertures for immovably retaining the coupling members in snug alignment.

9. Apparatus according to claim **8** wherein each of the said coupling members defines a support surface for supporting an arrow to be propelled by the bow to prevent said arrow from contacting an operator's hand grasping the bow.

10. Apparatus according to claim **9** wherein the coupling members are constructed of metal and the legs are secured to each bow limb by a bonding agent.

11. Apparatus according to claim **8** wherein the aligned apertures are tapered such that they form a continuous tapered hole extending through at least a majority of the ribs, one of the ribs defining a female threaded portion with a coil spring engaging the threads, and wherein the releasable bolting means includes a tapered pin having a male threaded portion for engaging the spring in said threads.

12. A two-piece bow comprising:

a. a pair of similar bow limbs longitudinally disposed in an end-to-end relationship having a bow-string interconnecting the outer extremities thereof, said bow limbs and bow-string being oriented to define a plane,

b. a first coupling member rigidly and immovably secured to an end of one bow limb, having at least one rib and a groove arranged transversely to said defined plane, a first aperture through said rib, the projection of which intersects the groove, and a second coupling member rigidly and immovably secured to an end of the other bow limb and having a configuration complementary to that of the first coupling member and at least one rib transverse to said defined plane, the rib of the second coupling member having a configuration to rest snugly in the groove of the first coupling member, a second aperture, said second aperture being positioned in the last mentioned rib and arranged and oriented to be coaxial with the first aperture when the coupling members are in mutual engagement,

c. releasable bolting means disposed in the said apertures for retaining the coupling members in their mutual engagement such that the bow limbs extend away from the coupling members in opposing directions; and

d. said groove and rib having engaging faces transverse to said defined plane, and wherein apertures are disposed adjacent the opposite side of the engaged coupling members, and including a hinge pin disposed in said last mentioned apertures extending through the coupled members

adjacent said opposite side of the engaged coupling members such that the bow limbs can be pivoted about the hinge pin into a substantially parallel, side-by-side position upon release of the bolting means.