April 20, 1943. W. L. MILLER 2,316,880

ARCHERY BOW

Filed Oct. 28, 1941

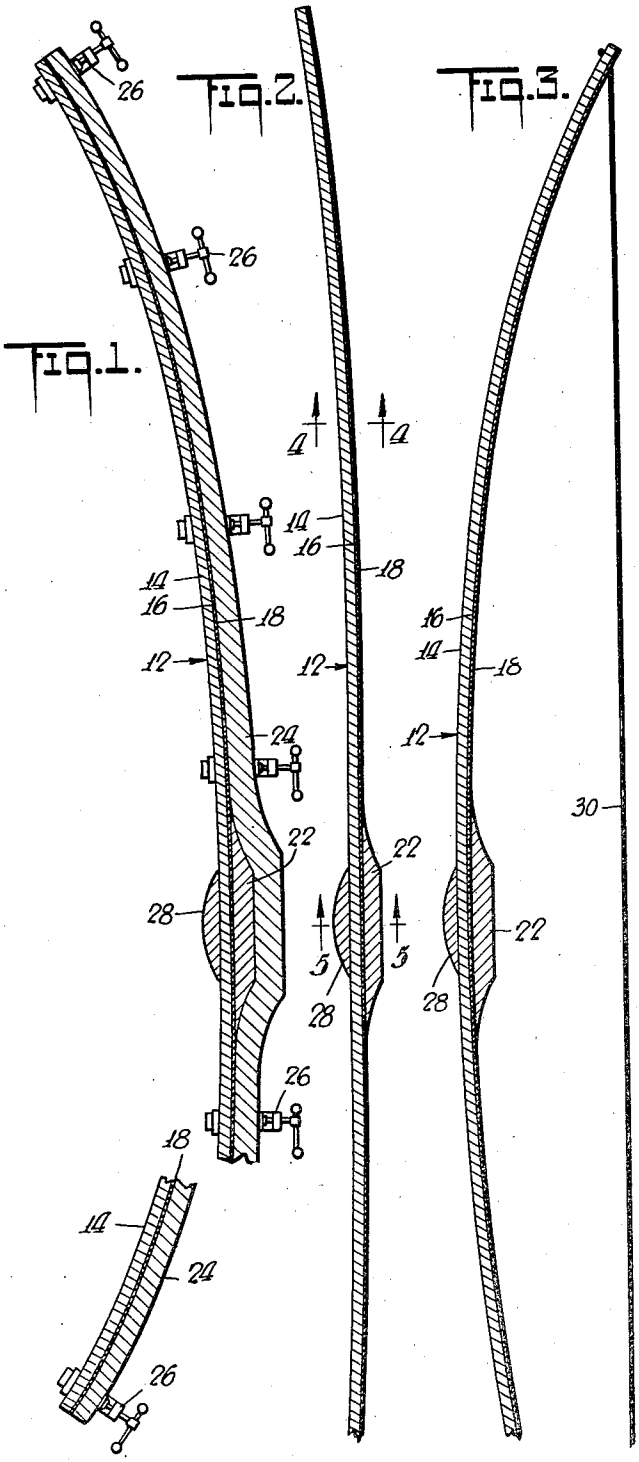


FIG. 1.

FIG. 2.

FIG. 3.

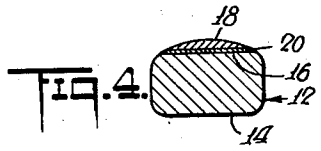


FIG. 4.

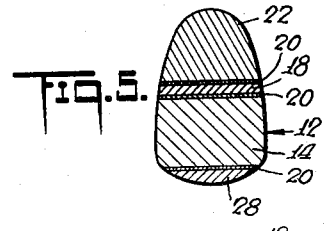


FIG. 5.



FIG. 6.

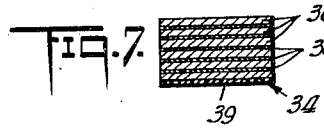


FIG. 7.

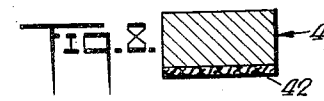


FIG. 8.

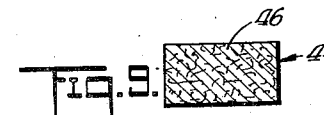


FIG. 9.

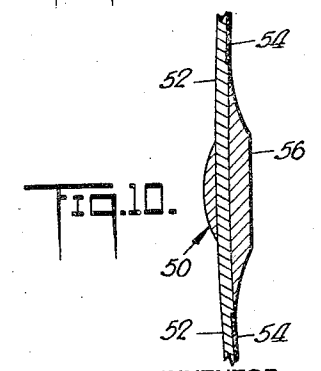


FIG. 10.

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ARCHERY BOW

Walter L. Miller, Teaneck, N. J.

Application October 28, 1941, Serial No. 416,810

2 Claims. (Cl. 124—23)

The present invention relates generally to improvements in archery bows, and it has relation specifically to a reinforced wooden archery bow and the method of constructing the same.

Archery bows are made generally of solid pieces of various woods, or laminated plies of such woods, having comparatively good elastic qualities. Such bows, however, have one common fault of being much weaker in compressive strength than in tensile strength. When a wooden bow is deflected for casting purposes, the wood on the "belly," which is the concave side of the bow next to the archer, is compressed while the wood on the "back," which is the convex side of the bow away from the archer, is placed under great tensile strain. Repeated or continual deflection of a bow causes the wood to take a permanent set in the direction of its bend or deflection, which set is due principally to the inherent weakness of the wood in compression. This set causes a great loss in efficiency or cast in the bow. Consequently, rare pieces of wood that take comparatively little set in use are valued highly by archers.

Numerous attempts have been made to overcome this setting tendency in wooden bows by applying materials, such as rawhide, vulcanized fiber, silk, linen or bamboo to the back of bows. Such a construction, however, does not correct the compressive weakness in such bows, and only visually appears to correct the set by pulling the bow backwardly or in a direction reverse to that of its normal cast deflection. Bows of such constructions do not have the proper tone resilience until after they are deflected normally to a position equal to the amount of their original set. This lack of resilience in compression causes a shifting of the neutral plane during flexing of the bow with the unsatisfactory result that such bows have insufficient stiffness at the beginning of their draw as compared with their stiffness at the end of their draw.

Bows have also been made with a re-curved or backwardly curved limb portion in an attempt to counteract this normal tendency to set. Such a construction results in a greater deflection of the bow limbs during the draw, and such bows are, therefore, much more likely to break when being used in casting.

The compressive weakness of all bow woods is increased or aggravated by increased humidity or increased heat. Such compressive weakness as results from changes in temperature causes a considerable drop in the efficiency or casting power and other desirable qualities of a bow, making casting with such bows extremely unsatisfactory in warm and humid weather.

An object of the present invention is the provision of a simple, efficient and inexpensive construction for archery bows which is capable of correcting the compressive weakness of the wood in an archery bow, thereby greatly increasing the useful life and casting power thereof.

Another object of the invention is to provide a construction for a wooden archery bow which will make it resistant to heat and moisture to such a high degree that atmospheric changes will have substantially little or no effect on the casting power thereof.

A further object of the invention is the provision of a new, simple and efficient method of constructing an archery bow embodying the principles of the invention.

Other and further objects and advantages of the invention reside in the detailed construction of the bow, which result is simplicity, economy and efficiency, and which will be apparent from the following description, wherein preferred forms of embodiment of the invention are shown, reference being had to the accompanying drawing, forming a part hereof, wherein like numerals indicate like parts, in which:

Fig. 1 is a fragmentary vertical sectional view of an archery bow made in accordance with the invention, illustrating the steps in the method of securing the several parts together while being deflected backwardly or in a reverse position;

Fig. 2 is a fragmentary vertical sectional view of the archery bow shown in Fig. 1, with the clamping elements removed, and showing its position when it is not under deflection;

Fig. 3 is a fragmentary vertical sectional view of the archery bow shown in Fig. 2, showing the bow string attached, the bow being braced and ready for casting;

Fig. 4 is a cross-sectional view of the bow shown in Fig. 2, the same being taken along the line 4—4 thereof, looking in the direction of the arrows;

Fig. 5 is a cross-sectional view of the bow shown in Fig. 2, the same being taken along the line 5—5 thereof, looking in the direction of the arrows;

Fig. 6 is a cross-sectional view, on an enlarged scale, of one form of plastic strip material which may be used for facing the belly of the bow;

Fig. 7 is a cross-sectional view, on an enlarged scale, of another form of plastic strip material of a laminated construction, which may be used for facing the belly of the bow;

Fig. 8 is a cross-sectional view, on an enlarged scale, of still another form of plastic strip material of a laminated construction, which may be used for facing the belly of the bow;

Fig. 9 is a cross-sectional view, on an enlarged scale, of still another modified form of plastic strip material having shredded fibrous material incorporated therein, which may be used for facing the belly of the bow; and

Fig. 10 is a fragmentary cross-sectional view of the handle section of a modified form of archery bow made in accordance with the invention, showing the facing material applied in the form of separate continuous strips covering each limb of the bow.

Referring now to the drawing, there is shown in Fig. 1 a wooden base member 12 deflected backwardly in a manner reverse to its normal casting position. The base member 12 may be deflected and held in such reverse deflected position in any suitable or convenient manner (not shown). In this deflected position the back 14 of the bow 12 is put under a compressive strain and its belly 16, which has been previously properly finished or prepared for receiving a facing strip material, is placed under a substantial tensile strain. While the bow 12 is maintained in such a reverse deflected position, there is applied adhesively thereto a relatively thin strip of a thermo-setting resinous material 18 to the belly or tension side thereof. The strip 18 may vary somewhat in thickness depending upon the kind of wood used in making the base member 12 and its thickness dimensions. I have found, however, that when the facing strip 18 is less than one thirty-second of an inch in thickness, its compressive and reinforcing strength is insufficient to improve the casting power of the bow, and that when the facing strip 18 is more than one quarter of an inch in thickness, its mass is such that its efficiency cannot be utilized. The plastic thermo-setting resins that I have found suitable for use as a satisfactory facing strip for the belly of archery bows may be designated generically as a thermo-setting resin, such as for example, phenol formaldehydes, urea formaldehydes or other thermo-setting aldehyde compounds combined with any suitable combining component. Each of the resins of these groups have a compressive strength of at least two to four times that of the wood used in forming the base member, which is essential for improving the casting power of the bow. A plastic substance having a compressive strength less than twice that of the wood in the wooden base member would not have sufficient advantages to warrant its use in a bow. Furthermore, each of the thermo-setting resinous plastics herein enumerated are resilient, waterproof and substantially unaffected by heat and humidity, which means that they will not be noticeably affected by changes in climatic conditions. Therefore, when incorporated in an archery bow in the manner described, the bow will give substantially constant casting power regardless of the prevailing temperature or humidity, which is highly desirable since most archery contests are held out of doors where the bows would be subjected to prevailing atmospheric conditions. The handle portion 22 may now be adhesively treated and positioned over the strip 18, if desired, and the entire assembly clamped and held tightly together by any conventional means, such as for example, by a suitable flexible clamping strip 24, which is removably secured at spaced intervals by means of conventional wood clamps 26. The strip 24 and series of spaced lamps 26 serve to hold the plastic strip 18 in place against the base member 12 until the adhesive material 20 has become thoroughly dried, after which they may be removed and the assembled bow finished and varnished in the ordinary manner. The back portion 28 of the handle member may be affixed at any convenient time.

When the clamping strip 24 and its clamps 26 are removed, and the assembly is released from its backwardly deflecting means, it will tend to straighten out, but due to the high compressive strength of the plastic material of the facing strip 18, which has been applied under a compressive strain, a slight reverse deflection will remain in the bow 12, as best shown in Fig. 2.

In Fig. 3 the bow string 30 has been strung on the bow 12, and the assembly assumes its normal braced position. It is obvious that, when the bow assembly is placed under a normal deflection, the plastic facing strip material 18 will be placed under a considerable increased compressive strain, which will be further increased at full draw.

The relatively thin strip 18 of plastic may, if desired, have various constructions without departing from the spirit of my invention. In Fig. 6 the facing strip 18 is shown made solidly of a thermo-setting plastic resinous material 32. It may be quite difficult to glue securely a solid strip of plastic material to the wooden base member 12, but, if a proper gluing operation is performed, the same will be found to give a satisfactory performance in casting and have all the desirable shooting qualities of the other forms of facing constructions hereinafter described.

In Fig. 7, the facing strip 34 is shown to be of a laminated construction, having alternate layers of plastic 36 and fabric, paper or other fibrous material 38. These layers of fabric, paper, etc. serve to reinforce the thermo-setting resinous plastic material 36, thereby tending to prevent fracturing, breaking, etc. In this construction, the attaching side of the strip 34 is provided with an exposed facing 39 of the reinforcing material 38 which serves to facilitate its attachment to the wooden base of the bow.

In the modification shown in Fig. 8, the plastic facing strip 40 is provided merely with a fabric, vulcanized fiber or other binding strip 42, which may be preferably molded thereto. The strip 42 may, however, be separate, if desired, and used merely for mounting the strip 40 upon the belly 16 of the bow 12. In the event the binding strip 42 is formed separate from the plastic strip 40, it may be first mounted on the wooden bow and then the strip 40 may be adhesively secured thereto, or vice versa.

In Fig. 9 the plastic strip 44 is shown reinforced with a shredded fibrous material 46, such as for example, shredded paper, cotton, wool, fabric or other suitable reinforcing materials. Portions of the fibers of the material 46 will become exposed when sanded preparatory to applying to the bow, and these exposed portions greatly facilitate securing the same to said bow.

In Fig. 10 there is shown a modified form of bow construction 50, wherein the strip of plastic material does not pass continuously through the handle portion 56 of the bow 50, but ends contiguous with said handle portion 56. In this modification, each limb 52 of the bow 50 has a strip of plastic material 54 from its opposite end to a point contiguous with said handle portion 56. There is no need for the plastic facing or reinforcing strip to extend continuously through and under said handle portion 56, because the

same is free of strain during casting and no casting advantage is gained thereby.

It is apparent from the above description of the invention that the ultimate desire is the application to the belly of a wooden archery bow of a facing strip of a thermo-setting resinous plastic material under a high degree of compression. While there is illustrated in the drawing only one simple method of accomplishing this result, it will be readily understood that other methods may be employed without departing from the spirit of the invention. For example, another method that may be advantageously employed by archers would be to cut the plastic facing strip material to a length slightly longer than the length of the bow to which it is intended to be applied. Then securely fasten the ends of such facing strip material to the ends of the bow, which will cause the intermediate portion of the plastic strip material to form a bulge outwardly and away from the corresponding portion of the belly of the bow. Such a bulge may be removed by gradually applying sufficient external pressure to that portion of the facing strip material to cause it to be compressed until it will lay flat along the surface of the belly of the bow. This intermediate portion which has been adhesively treated may then be secured to the belly of the bow and held thereagainst by external pressure until the adhesive has become thoroughly dry. By factory methods it may be possible to precompress the plastic facing strip material, and then apply it to the belly of the bow in such precompressed condition to attain the desired result in the finished bow.

With the present invention it is possible to construct archery bows having good casting power out of inferior and cheaper woods. Furthermore, archery bows embodying the invention have greatly increased casting power over archery bows constructed solely of wood identical to the wood used in making the base member of my improved bow. Bows made according to the present invention are substantially unaffected by heat and moisture, and, as a result, have substantially constant casting power regardless of prevailing atmospheric conditions. With the present invention the normal and useful life of wooden archery bows is greatly increased, and the likelihood of breakage due to compressive collapse during casting is greatly diminished.

The present invention may readily be applied to existing bows, and is not limited in its application to the construction of new archery bows. In the event an archer is desirous of applying a plastic facing strip 18 to his old bow, this may conveniently be done merely by removing from the limb an amount of wood approximately equal to the thickness of the plastic strip to be applied. The plastic strip 18 may then be applied in the identical manner described hereinabove in connection with the building of a new bow. After the facing strip 18 is applied to the wooden base member 12, the assembly may be finished and varnished as in the case of a new bow.

When use is made of the expression "thermo-setting plastic material" in the claims, I mean to include such material in any of the various forms illustrated in the drawing, viz: solid plastic material, laminated plastic material or plastic material reinforced with shredded reinforcing matter.

Although I have only described in detail several modifications which the invention may assume, it will be readily apparent to those skilled in the art that the same is not to be so limited, but that various other modifications may be made therein without departing from the spirit thereof or from the scope of the appended claims.

What I claim is:

1. An archery bow comprising a wooden base member having its belly faced with a relatively thin strip of a thermo-setting plastic material that has been applied so as to be under a compressive strain when said bow is unbraced and at rest, said thermo-setting plastic material consisting of an aldehyde compound combined with any suitable combining component.

2. An archery bow comprising a wooden base member having a pair of outwardly and oppositely extending limb portions, each of said limb portions being covered with a relatively thin flexible strip of thermo-setting plastic material that has been applied in such a manner that said material is under a compressive strain when said bow is unbraced and at rest, said thermo-setting plastic material consisting of an aldehyde compound combined with any suitable combining component.

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