

[54] **HUNTING ARROW**

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[51] Int. Cl. **F41b 5/02**

[58] Field of Search **273/106.5 R, 106.5 B**

[56] **References Cited**

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[57] **ABSTRACT**

A hunting arrow adapted for accurate use in conjunction with a wide range of bow weights. The center of

gravity of the arrow is located in proximity to the longitudinal midpoint of the arrow (preferably just forwardly thereof) by demountably securing primary and secondary blades of the broad head type hunting head directly to the shaft. This is accomplished by providing first and second intersecting axial slots in the conically tapered nose portion of the shaft and corresponding pairs of diametric grooves on the outer surface of the arrow shaft. Each pair of diametric grooves are aligned with the plane of a corresponding slot and open axially through the nose portion of the shaft. The second blade has rearwardly diverging legs joined at their forward portion by a stabilizing bridge removably received within the second slot. Spaced rearwardly of the stabilizing bridge, locating feet on the legs extend opposingly toward, and are received in, the grooves aligned with the plane of the second slot. The primary blade has rearwardly divergent legs joined at their forward portion by a generally triangular web. A portion of the stabilizing edge along the rear of the web is removably received within the first slot and embraces the stabilizing bridge of the secondary blade received within the second slot. Contact surfaces on the primary blade engage the conically tapered nose portion of the shaft, and locating feet on the legs of the primary blade extend opposingly toward, and are received in, the grooves aligned with the plane of the first slot. Locking ribs on the locating feet of the primary blade interengage anchor bores releasably to maintain the primary blade, and thereby the secondary blade as well, on the shaft.

7 Claims, 7 Drawing Figures

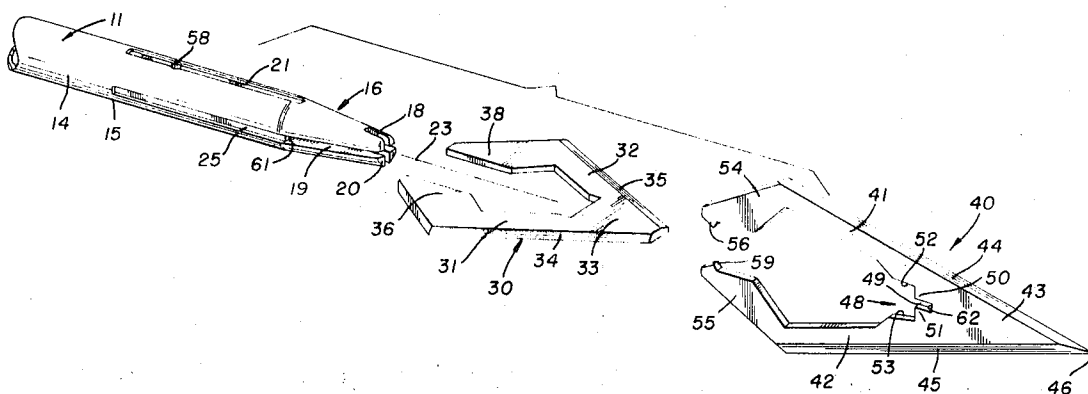


FIG. 1

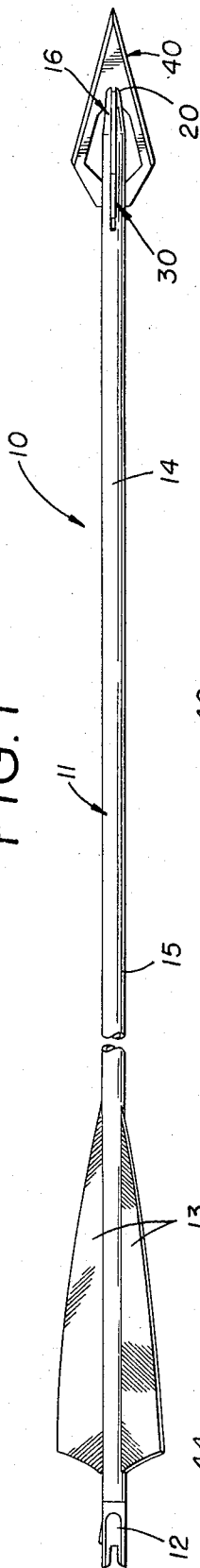
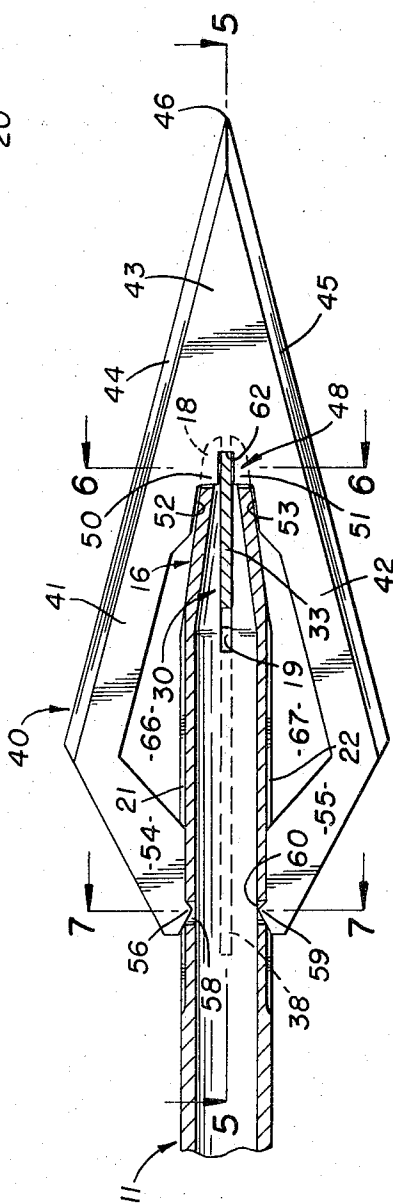


FIG. 4

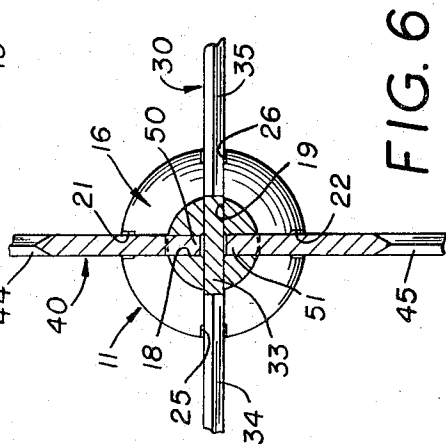


FIG. 6

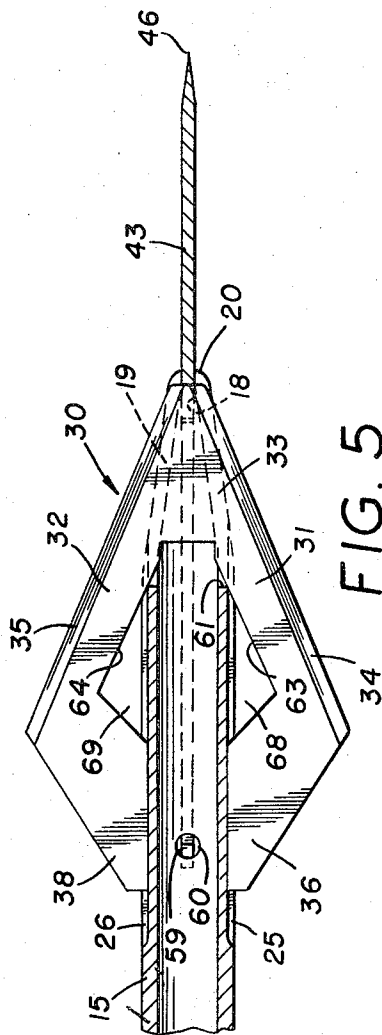


FIG. 5

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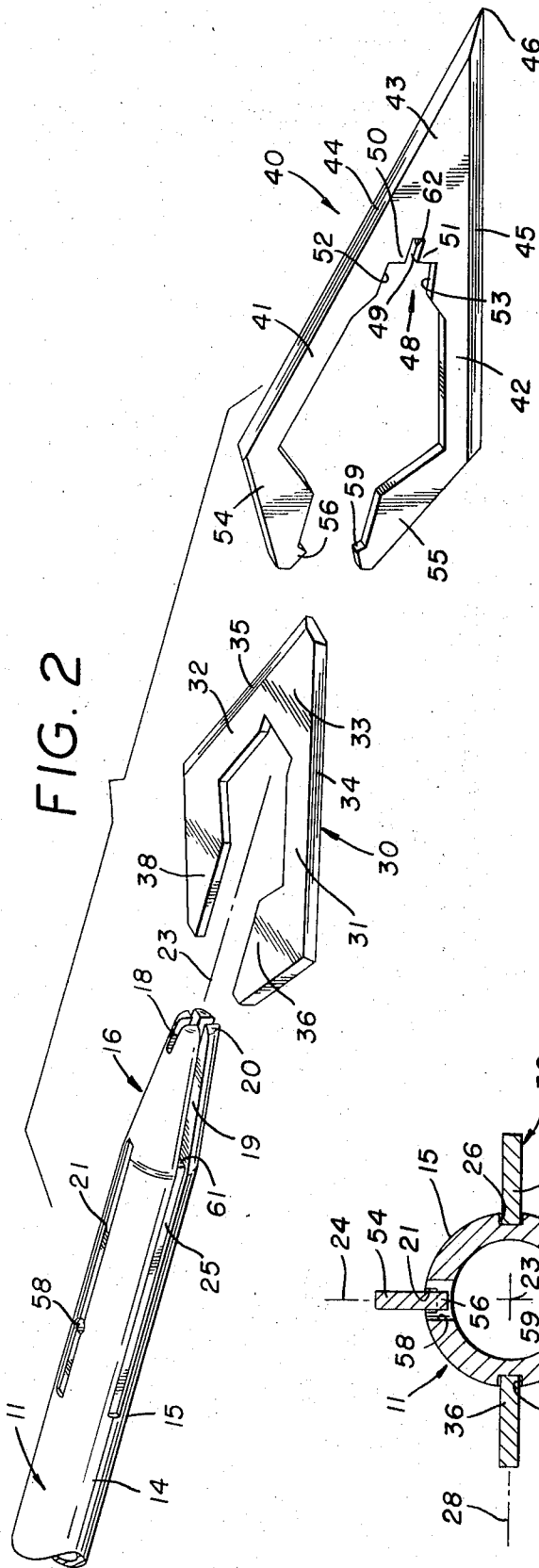
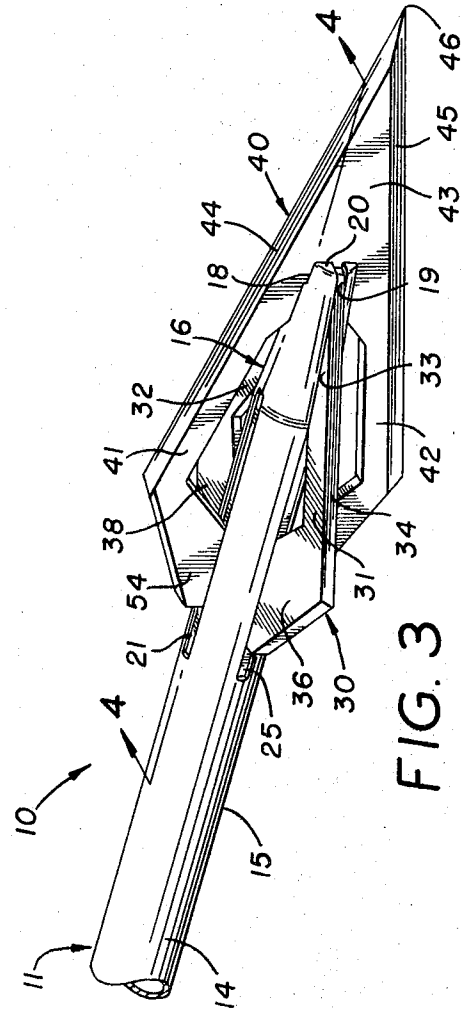
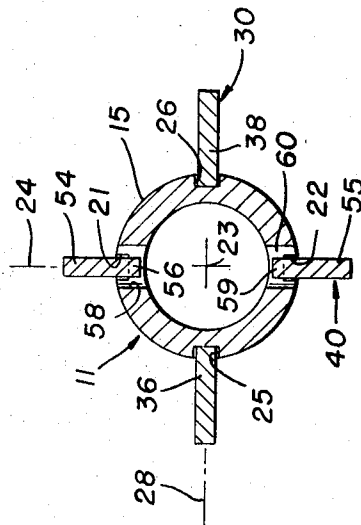


FIG. 7

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HUNTING ARROW

BACKGROUND OF THE INVENTION

The present invention is related to arrows and particularly the construction of a hunting arrow which will permit it to be used accurately in conjunction with a wide range of bow weights.

The proper selection of an arrow has long been known to require the consideration of numerous factors. The three principal properties deemed essential to the selection of a proper arrow for a given bow of specific draw weight are: suitable weight; sufficient rigidity to withstand the sudden force applied thereto by the bow string at the release; and, sufficient resilience to behave in accordance with the "Archer's Paradox."

The last two factors are generally combined and expressed as the arrow's spine. It has heretofore been considered an inviolable tenet that spine must be rather closely matched to the bow for accuracy. In fact, arrows are classified by an indication of the spine in terms of the draw weight for the bow with which they are intended to be used, such classification being generally divided into five pound increments for both target and hunting arrows.

In order fully to understand the unique result occasioned by a hunting arrow embodying the concept of the present invention, one must at least generally understand the dynamic action of the arrow during that period of time between the release and the moment that the arrow clears the bow on its flight to the target.

During the late 1920's and early 1930's several men hypothesized and did rather elaborate experiments for that time to show that the arrow is subjected to rather complex movement during the initial portion of its flight, the cause and result of its movement being referred to as the "Archer's Paradox," or, originally, the "Toxophilist's Paradox" from an article by Edward J. Rendtorff published in the Feb. 8, 1913, edition of "Forest and Stream" magazine.

The contortions of an arrow during the initial stage of its flight is truly a paradox in that what happens may appear to be absurd upon initial consideration but is, upon more detailed investigation, proven to be well-founded. More precisely, the "Archer's Paradox" is the phenomenon that, after the release, an arrow will follow the course along which it is aimed when at full draw, even though the bow string tends to force it elsewhere.

Because, for a right-handed archer, an arrow passes to the left side of the bow handle during the course of its path therepast, while, at the same time, the bow string returns to its position in alignment with the vertical center line of the bow, the arrow should theoretically follow a path extending to the left of the bow. To the contrary, however, an arrow that is properly matched to the draw weight of the bow will actually bend around the bow handle to follow a course along the line of aim rather than slant off to the left. This is the phenomenon that is termed the "Archer's Paradox."

By virtue of high speed photography the course of the arrow during the initial phase of its flight has been found to follow a very definite cycle. As the bow string applies its driving force to the arrow and the string advances toward the bow from the full draw position, the lateral inclination of the arrow to the plane in which the

bow string moves (with the nock engaging the string and the footing, or that portion of the arrow just rearwardly of the head, or pile, engaging the left side of the bow) tends to impart a compound motion to the arrow — one component of this motion being directed forwardly and one component being directed laterally away from the bow. Both components of motion are opposed by the static inertia of the arrow so that it immediately bends with the concavity of that bend facing to the left away from the bow.

With a conventional finger loose the string rolls off the finger tips, throwing the string a half inch or more to the left of its draw position. A finger loose of this nature also contributes to the aforesaid initial bending of the arrow.

As this bending increases, the arrow begins to lose contact with the side of the bow. Some writers have hypothesized that this results, in part, as a bounce away from the bow and others have advanced the theory that it is a partial weathervaning caused by movement of the bow string to the right as the foreshaft of the arrow moves to the left — this rotation occurring about the center of gravity of the arrow, the point at which the lateral application of the arrow's static inertia can be considered to be applied. In any event, it has been found that after the arrow loses contact with the bow the subsequent movement of the arrow, as hereinafter more fully described, must not bring the arrow back into contact with the bow or consistent accuracy will be destroyed.

After the head, or pile, has moved a short distance beyond the face of the bow, and as the center of gravity of the arrow approaches the bow, the resilience of the arrow tends to straighten it against its original bend and even reversely bend it about the center of gravity. This tendency of the arrow to reverse its bend is augmented by the fact that while the offset angle at which the arrow is inclined to the plane through which the bow string moves is relatively small at full draw, the offset angle increases considerably as the nock approaches the bow. The bow string thus applies an increasing lateral component to the nock (directed to the right and therefore toward the bow) while the mass of the head, or pile, tends to maintain it on its forward course so that the arrow again bends about the center of gravity but now with the concavity directed toward the right — i.e., toward the bow.

Here, too, the resilience of the arrow resists bending and begins to straighten the arrow even before the nock has left the string until, as the nock leaves the string, it snaps to the left and clears the bow.

After the arrow clears the bow the arrow straightens, the lateral vibrations dampen and the arrow follows the original line of sight toward the target.

Although prior workers in this art may have known that the location of the arrow's center of gravity determines the spot along the arrow shaft about which the bends occur, it has not heretofore been fully appreciated what an important factor the location of the center of gravity is in assuring that the arrow does not re-contact the bow and thereby destroy the accuracy of a given arrow when used in conjunction with a wide range of bow weights.

Turning specifically now to the consideration of the hunting arrows, a number of points have been used but one of the most popular, particularly for larger game, is the broad head. The popularity of this tip was even

further augmented when replaceable blades were devised, as disclosed in U.S. Pat. No. 2,912,247. However, the concept of the aforesaid patent required that a mounting ferrule be secured to the arrow shaft with the blades being demountably attached to the ferrule. Although this approach has met with success, accuracy with an arrow employing such a head construction requires the close matching of the arrow's spine with the draw weight of the bow, as described above.

SUMMARY OF THE INVENTION

It is, therefore, a primary object of the present invention to provide a hunting arrow on which broad head blades can be readily replaced and which can be used with bows having a wide range of draw weights.

This and other objects, together with the advantages thereof over existing and prior art forms which will become apparent from the following specification, are accomplished by means hereinafter described and claimed.

In general, a hunting arrow embodying the concept of the present invention has a shaft that is either metallic or a plastic based material having comparable flexural and columnar characteristics. A nock means is provided on the rearward end of the shaft, fletching is applied forwardly of the nock means and a hunting head comprising at least one blade means is removably secured directly onto the forward end of the shaft.

When only one blade means is utilized it would be that which is hereinafter designated as the primary blade means. Nevertheless, it is the normal practice to use both a primary and secondary blade means removably secured directly to the arrow's shaft substantially as follows. First and second diametric slots open through the nose portion of the shaft and extend axially rearwardly, with the second slot having a greater axial extent than the first slot. Diametric grooves in the outer surface of the shaft are aligned with the plane of each slot and extend axially along the shaft. An anchor means is provided in each groove lying in the same plane as the first slot.

The secondary blade means has opposed legs that are joined, at their forward portion, by a stabilizing bridge. Opposed, locating feet, one on each leg, are spaced rearwardly of the stabilizing bridge. When positioned on the arrow shaft the stabilizing bridge is removably received within the second slot and the locating feet are removably received within the two grooves aligned with the plane of the second slot.

The primary blade means has a pair of legs that diverge rearwardly from a frontal, generally triangular, web, the rear portion of which presents a stabilizing edge. Opposed, locating feet, one on each leg, are spaced rearwardly of the stabilizing edge, and each locating foot presents a locking means. When positioned on the arrow shaft a portion of the stabilizing edge is removably received within the first slot and interengaged with the stabilizing bridge of the secondary blade means received in said second slot so as to restrain the secondary blade means in mounted position on the shaft. The locating feet on said primary blade means are removably positioned within the grooves aligned with the plane of the first slot, and the locking means therein interengage the anchor means to maintain both the primary and secondary blade means in position on said shaft.

One preferred embodiment of the present invention is shown by way of example in the accompanying drawings and described in detail without attempting to show all of the various forms and modifications in which the invention might be embodied; the invention being measured by the appended claims and not by the details of the specification.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation of a hunting arrow embodying the concept of the present invention;

FIG. 2 is an enlarged, exploded, frontal perspective of the hunting tip employed on the arrow depicted in FIG. 1;

FIG. 3 is an assembled, frontal perspective of the hunting tip depicted in FIG. 2;

FIG. 4, appearing on the same sheet of drawings as FIG. 1 is a longitudinal section taken substantially on line 4—4 of FIG. 3 depicting the primary blade means of the hunting tip in elevation;

FIG. 5 is also a longitudinal section but taken substantially on line 5—5 of FIG. 4 and depicting the secondary blade means of the hunting tip, oriented transversely of the primary blade means, in elevation;

FIG. 6 is a transverse section taken substantially on line 6—6 of FIG. 4; and,

FIG. 7 is a transverse section taken substantially on line 7—7 of FIG. 4 and appears on the same sheet of drawings as FIG. 2.

DESCRIPTION OF A PREFERRED EMBODIMENT

A hunting arrow embodying the concept of the present invention is designated generally by the numeral 10 on the attached drawings. The arrow 10 has a shaft 11 which, for strength and low weight, is preferably tubular and an aluminum alloy, although any comparable material would suffice. A nock 12 is secured to the rearward end of the shaft 11, and fletching 13 is affixed to the shaft 11 forwardly of the nock 12.

Although the outer surface on the main body portion 14 of the shaft 11 may be of any accepted configuration, the customary cylindrical outer surface 15 depicted is quite satisfactory. In any event, the nose portion 16 of the shaft 11, as best seen in FIG. 2, is preferably tapered conically, as shown, and provided with first and second diametric slots 18 and 19, respectively, which preferably intersect at right angles and open through the forward tip 20 of the nose portion 16. The slots 18 and 19 extend axially with respect to the shaft 11 with the second slot 19 having a greater axial extent than the first slot 18, although even being of greater axial extent second slot 19 preferably terminates in proximity to the juncture of the main body portion 14 with the tapered nose portion 16.

A pair of diametric grooves 21 and 22 within the cylindrical outer surface 15 on the main body portion 14 of shaft 11 are oriented parallel to the axis 23 of the shaft 11 and extend rearwardly from the nose portion 16, through which they open, within the plane 24 of the first slot 18 for a purpose more fully hereinafter described.

A second pair of diametric grooves 25 and 26 within the cylindrical outer surface 15 of the main body portion 14 of shaft 11 are also oriented parallel to the axis 23 of the shaft 11 and extend rearwardly from the nose portion 16, through which they open, within the plane

28 of the second slot 19 for a purpose more fully hereinafter described.

A secondary blade means 30 is demountably carried on the shaft 11. The secondary blade means 30 has a pair of legs 31 and 32 that diverge rearwardly from a stabilizing bridge 33 that is removably fitted within the second slot 19. The radially outermost border on each of the legs 31 and 32 is sharpened to provide cutting edges 34 and 35, respectively, inclined with respect to the axis 23 of the shaft 11.

Spaced rearwardly of the stabilizing bridge 33, opposed locating feet 36 and 38 on the legs 31 and 32 extend toward the shaft and are received within the respective grooves 25 and 26. Because the grooves 25 and 26 lie within the same plane as the second slot 19, and open axially through the nose portion 16, the secondary blade means may be readily positioned on, or removed from, the shaft 11 by axial translation. Moreover, the interaction of the locating feet 36 and 38 with the corresponding grooves 25 and 26 cooperate to stabilize the secondary blade means 30, as hereinafter more fully described.

A primary blade means 40 is also demountably carried on the shaft 11. The primary blade means 40 has a pair of legs 41 and 42 that diverge rearwardly from a generally triangular web portion 43. The radially outermost borders of the web portion 43 continue as the radially outermost borders of the two legs 41 and 42, the borders being sharpened to provide cutting edges 44 and 45, respectively, that diverge rearwardly from the forward apex 46 defining the point of the primary blade means 40.

The rearward portion of the web 43 presents a stabilizing edge 48 that cooperatively engages at least the first slot 18 and preferably also the stabilizing bridge 33 of the secondary blade means 30. Specifically, the stabilizing edge 48 is provided with a recess 49 having a span that is substantially equivalent to the thickness of the secondary blade means 30. When both the primary and secondary blade means are properly positioned on the shaft, the major axial extent of the stabilizing bridge 33 lies within the second slot 19, and that portion of the stabilizing bridge 33 which intersects the plane 24 of the first slot 18 is embraced by the shoulders 50 and 51 that define the side walls of recess 49. The shoulders 50 and 51 are thus removably received within the first slot 18 on either side of that portion of the secondary blade means received within the second slot 19 to enhance the stability of the primary blade means 40 in directions other than those within its own plane.

A pair of opposed, contact surfaces 52 and 53 are provided rearwardly of the respective shoulders 50 and 51. Surfaces 52 and 53 are oriented at substantially the same degree of inclination as the conically tapered nose portion 16 of the shaft 11 and contact the nose portion 16 to enhance the stability of the primary blade means 40 within its own plane.

Spaced rearwardly of the web 43, opposed locating feet 54 and 55 on the legs 41 and 42 extend toward the shaft 11 and are received within the respective grooves 21 and 22.

The engagement of the feet 54 and 55 with the respective grooves 21 and 22 functionally cooperates with the aforescribed interaction of the shoulders 50 and 51 with the first slot 18 and the interaction of the contact surfaces 52 and 53 with the conically tapered nose portion 16 to assure stability of the primary blade

means 40 when it is removably secured to the shaft 11.

A locking lug 56 extends radially inwardly of the locating foot 54 and is receivable within an anchor means in the groove 21 in the form of a radially directed bore 58 when the primary blade means is properly positioned on the shaft. Locking lug 59 on locating foot 55 is similarly receivable within a radially directed bore 60 in groove 22. This interaction of the locking lugs with their respective anchor means maintains the primary blade means 40 releasably secured to the shaft, the release being affected by spreading the legs, within their elastic limit, sufficiently to clear the lugs from their anchor means.

When the primary blade means 40 is thus mounted onto the shaft 11, the stabilizing bridge 33 is axially captured between the base 61 of slot 19 and that portion of the web 43 forming the end wall 62 of recess 49 to maintain the secondary blade means 30 against axial displacement. As shown, the inner edges 63 and 64 of the respective legs 31 and 32 rather than the bridge itself may engage the edges of base 61.

The secondary blade means 30 is stabilized against lateral movement not only by the engagement of the locating feet 36 and 38 with the respective grooves 25 and 26 but also by the simultaneously cooperative interaction of the stabilizing bridge 33 with the slot 19 and the recess 49 and the inner edges 63 and 64 on legs 31 and 32 with base 61.

It will be observed that with both the primary and secondary blade means, the respective legs (41, 42 and 31, 32) are of such dimension within the plane of their respective blade means that as they diverge rearwardly they leave gaps 66, 67, 68 and 69 between the respective legs 41, 42, 31 and 32 and the outer surface 15 of the shaft 11 in order to permit the flow of air there-through and thereby avoid any aerodynamic "planing," or "weathervaning," that might otherwise occur should the primary or secondary blade means present a full imperforated surface.

Although the invention has been described with both primary and secondary blade means included in the hunting head, one could, if desired, eliminate the secondary blade means 30 and merely mount the primary blade means 40 onto the shaft 11. Whereas, when both blade means are utilized the interaction between the recess 49 and the stabilizing bridge 33 on the secondary blade means 30 may also contribute to the lateral stability of the primary blade means 40 (by virtue of the engagement of the stabilizing bridge 33 with the second slot 19), when the primary blade means 40 is mounted on the shaft 11 without the use of the secondary blade means 30, the engagement of contact surfaces 52 and 53 with the nose portion 16 of the shaft 11 must be solely responsible for lateral stability of the primary blade means within the plane 24 of the first slot 18; lateral stability in other planes being accomplished by engagement of the shoulders 50 and 51 in the first slot 18 and by engagement of the feet 54 and 55 within grooves 21 and 22.

In either event, by mounting the blade means directly to the shaft 11 a considerable amount of weight can be eliminated from the nose portion of the arrow and still provide demountable blades.

With the concentration of weight in the nose portion of the arrow, as occurred with prior known arrow head constructions, the center of gravity was spaced suffi-

ciently forwardly with respect to the longitudinal midpoint of the arrow that the shaft had been found to require a considerable increase in the amount of its spine for a bow of any given draw weight. Moreover, the increased weight imparted to arrows embodying such constructions forced those arrows to follow a trajectory having considerable curvature, a particularly undesirable attribute for a hunting arrow. In addition, when there is a concentration of weight at the nose, an arrow will drop markedly after a relatively short flight.

On the other hand, a construction embodying the present invention avoids these disadvantages and permits the center of gravity to lie closer to the midpoint of the arrow, actually on a point just forwardly thereof. With the center of gravity located just forward of the midpoint, the arrow flies with less wobble and can accommodate the bend induced thereto by bows of considerably varied draw weight without loss of accuracy, as occasioned, for example, by the arrow re-engaging the bow before it advances fully therepast. In fact, experiments have shown that such an arrow may be perfectly suited to bows in a draw weight range of approximately 25 pounds. That is, an arrow embodying the concept of the present invention may be manufactured with a spine as equally suitable for bows of 40 pound draw weight as for bows through 65 pound draw weight. Moreover, by thus eliminating the addition of unnecessary weight a considerably flatter trajectory is available for the energy expended to drive the arrow.

Accordingly, the subject hunting arrow is readily adapted for use with interchangeable broad head blades and can be used with bows having a wide range of draw weights.

I claim:

1. A hunting arrow comprising, a shaft having a rearward end, a nose portion and an outer surface, a nock means secured to the rearward end of said shaft, fletchings secured to said shaft forwardly of the nock means, first and second diametric slots opening in a plane axially through the nose portion of said shaft, diametric grooves in the outer surface of said shaft aligned with the plane of said first slot, an anchor means in at least one of said grooves, primary broadhead blade means having a generally triangular web portion terminating in an apex defining the point of said blade means, opposed legs diverging rearwardly from said web portion, a stabilizing edge means on said web portion medially

of said legs, a locating foot on each leg spaced rearwardly of said web portion, locking means carried on said locating feet, said stabilizing edge means removably receivable within said first slot and said locating feet removably receivable in said grooves, said locking means interengaged with said anchor means releasably to maintain said primary blade means on said shaft, said second slot having a greater axial extent than said first slot, a second set of diametric grooves in the outer surface of said shaft aligned with the plane of said second slot, a secondary broadhead blade means having opposed legs joined at the forward portion thereof by a stabilizing bridge, a locating foot on each leg of said secondary blade means spaced rearwardly of said stabilizing bridge, said stabilizing bridge removably receivable in said second slot and the locating feet on said secondary blade means removably receivable in the grooves aligned with the plane of said second slot, the stabilizing edge on the web portion of said primary blade means cooperating with the stabilizing bridge means on said secondary blade means to maintain said secondary blade means on said shaft when said primary blade means is secured thereto.

2. A hunting arrow, as set forth in claim 1, in which the stabilizing edge means on said primary blade means has a recess bounded by shoulder means, said recess engaging the bridge portion of said secondary blade means and said shoulder means engaging the first slot in the nose portion of said shaft.

3. A hunting arrow, as set forth in claim 2, in which said recess engages said bridge means substantially completely within the nose portion of said shaft.

4. A hunting arrow, as set forth in claim 3, in which the nose portion of said shaft is conically tapered, and in which contact surfaces are provided on said primary blade means rearwardly of said shoulder means to engage said tapered nose portion when said primary blade means is mounted on said shaft.

5. A hunting arrow, as set forth in claim 4, in which said first and second slots are substantially perpendicular and the span of said recess is substantially equal to the thickness of said secondary blade means.

6. A hunting arrow, as set forth in claim 5, in which the span of said first slot is substantially equal to the thickness of said primary blade means.

7. A hunting arrow, as set forth in claim 6, in which the shaft is metallic.

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