

[54] **EXPANDABLE HUNTING ARROW**

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[22] Filed: **May 9, 1972**

[21] Appl. No.: **251,647**

[52] U.S. Cl. **273/106.5 B**

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

[58] Field of Search **273/106.5 R, 106.5 B; 43/6**

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[57]

ABSTRACT

A hunting arrow has a tubular leading end portion provided with radially positioned, longitudinally extending slots. Mounted within the tubular portion are a rearwardly positioned fixed block and a forwardly positioned movable block. Blade elements comprising pivotally connected long and short sections extend between the blocks in alignment with the slots and are pivoted to the blocks, the long section being pivoted to the movable block and the short section being pivoted to the fixed block. Elastic bands are stretched between the two blocks and urge the movable block toward the fixed block. The blade elements while in longitudinal alignment tend to keep the movable block from moving. A release element is pivotally mounted to the short blade section and engages a slot in the longer blade section to keep the blade sections locked in longitudinal alignment. A projection on the release element projects outwardly of the tubular section and when engaged by the flesh of an animal upon arrow penetration releases the blade elements to be pivoted outwardly of the tubular section as the movable block moves rearwardly under the urging of the elastic bands.

10 Claims, 8 Drawing Figures

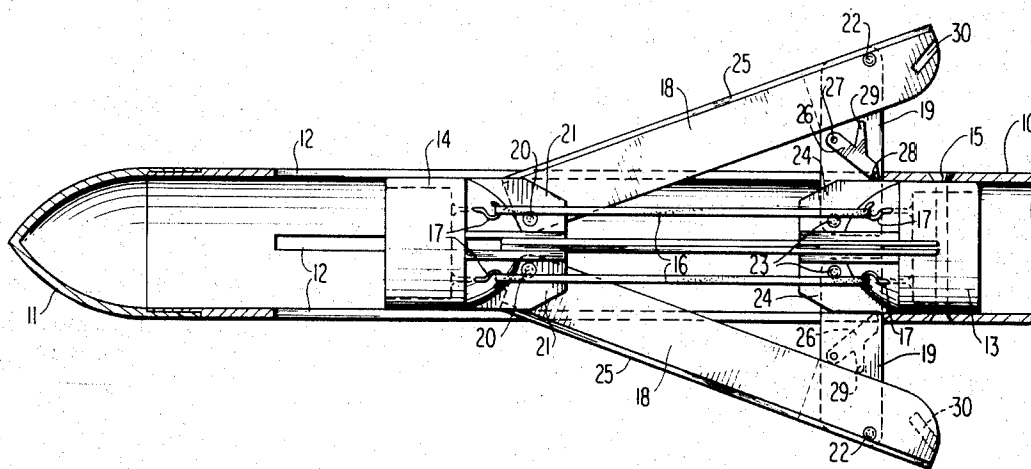


FIG1

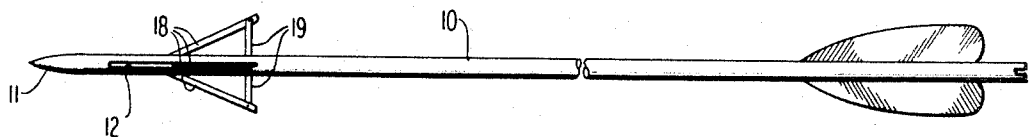


FIG2

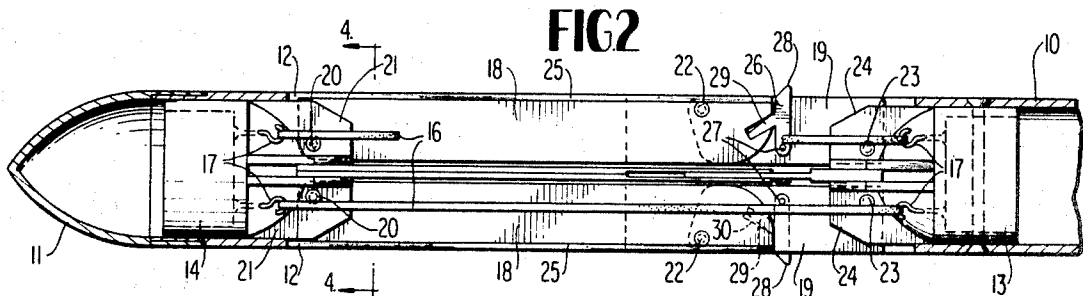


FIG7

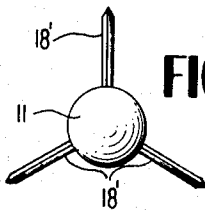


FIG8

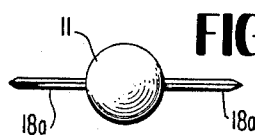


FIG3

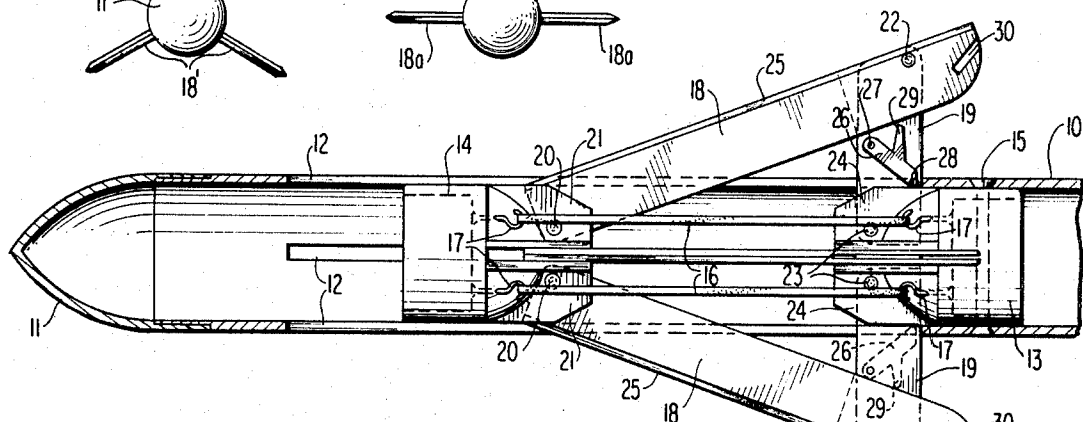


FIG4

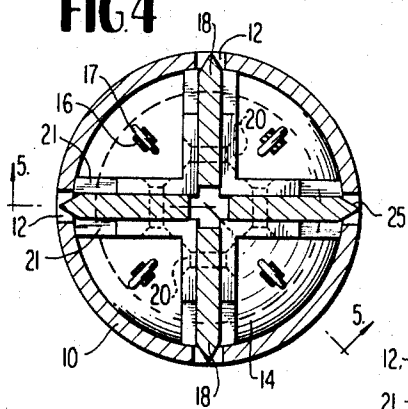


FIG5

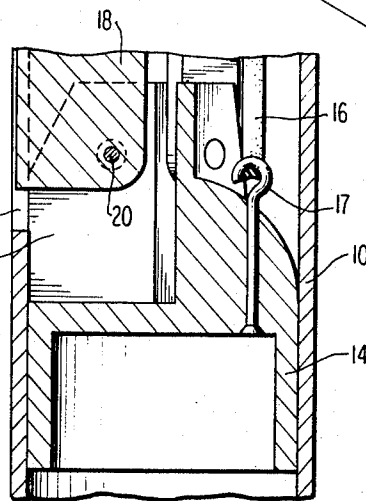
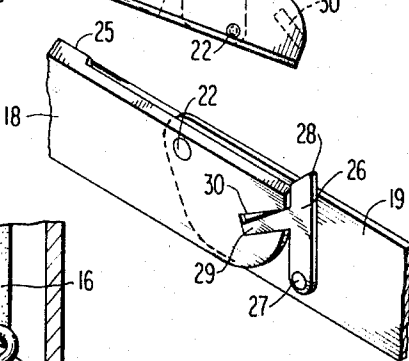


FIG6



EXPANDABLE HUNTING ARROW

The object of the invention is to provide a superior hunting arrow for big game bow hunters which is extremely reliable in operation and will possess greatly increased killing power as compared to standard fixed blade arrows in use today. The above will be accomplished with no significant increase in the weight of the arrow compared to conventional types and no increase in arrow shaft diameter. The arrow constructed in accordance with the invention will have a greater velocity and range, a more accurate trajectory and much greater penetrating power, with the result that it can do greater damage to the vital organs of the game after penetrating the hide and rib cage. The arrow, according to the invention, is also more humane than conventional arrows in that it will kill more quickly rather than producing a superficial wound or a wound causing the animal to bleed to death slowly or suffer.

There have been some prior art proposals for expanding blade hunting arrows and one such example is shown in a prior United States Patent. The expandable and retractable arrow tip blades in this patent are cam-operated giving rise to the necessity for accurately machined parts which are too costly to be practical in large scale production. In general, the prior art devices of this type have not been adopted widely because of excessive cost or lack of sufficiently reliable operation. The present invention is thought to overcome these deficiencies in the prior art by the provision of an extremely reliable blade release mechanism and locking means and a very simple and economical blade expanding energy source which may derive its power from two, three or four rubber bands and associated fixed and movable plugs inside of the tubular arrow shaft.

Other features and advantages of the invention will become apparent during the course of the following description.

BRIEF DESCRIPTION OF DRAWING FIGURES

FIG. 1 is a side elevation of a hunting arrow equipped with the expandable and retractable blades and blade operating means of the invention.

FIG. 2 is a large fragmentary longitudinal vertical section through the leading end portion of the arrow shaft and showing the blades locked in retracted positions within the arrow shaft.

FIG. 3 is a similar view showing the blades in their active or expanded positions outside of the arrow shaft and under influence of the blade expanding mechanism in the arrow shaft.

FIG. 4 is an enlarged transverse vertical section taken on line 4—4 of FIG. 2.

FIG. 5 is a horizontal section taken on line 5—5 of FIG. 4.

FIG. 6 is an enlarged fragmentary perspective view of a blade pivot joint with an associated locking and release element.

FIG. 7 is a leading end view of an arrow with three expandable blades in accordance with a modification.

FIG. 8 is a similar view of an arrow with two blades according to another modification.

DETAILED DESCRIPTION

Referring to the drawings in detail wherein like numerals designate like parts, it will be noted that FIGS. 1-6 depict a hunting arrow having four circumferen-

tially equidistantly spaced blades whereas FIGS. 7 and 8 depict arrows having three and two blades, respectively. The invention is in no sense limited to any one of these blade arrangements and the arrow having four blades has been illustrated in details in the drawings for convenience of illustration and to depict the most complex arrangement contemplated under the invention, which arrangement is still exceedingly simple.

Continuing to refer to the drawings, the numeral 10 designates a thin-walled tubular arrow shaft formed of steel, aluminum or fiberglass provided near and rearwardly of its leading tip 11 with a plurality, such as four, circumferentially equidistantly spaced radial slots 12, which slots extend rearwardly along the arrow shaft for several inches. Regarding the length of the slots 12 and the length and size of the expandable blades, to be described, an important advantage of the invention is that the blades can be made much larger than conventional fixed arrowhead blades because they are fully retracted during flight and spring to expanded positions only after penetrating the body of the game.

Mounted within the bore of the tubular shaft 10 are a two cylindrical plugs 13 and 14 of identical construction. The plug 13 is fixedly secured to the arrow shaft by a cross pin or rivet 15 while the plug 14 is free to reciprocate axially in the bore of the arrow shaft. The plug 14 is constantly biased toward the fixed plug 13 by resilient tension elements 16 which may be simple elastic bands. The opposite ends of the elastic bands are held by hooks 17 anchored to the opposing faces of the plugs 13 and 14. The number of elastic bands employed will correspond to the number of expandable and retractable blades, and four sets of blades and elastic bands are shown in the illustrated embodiment.

The hunting arrow comprises four circumferentially equidistantly spaced blade units, each unit consisting of a long blade 18 and a relatively short blade 19. The forward ends of the long blades 18 are pivotally connected at 20 to pairs of flange plates 21 on the plug 14, each pair receiving one long blade 18 therebetween. Near their rearward ends, the blades 18 are pivoted at 22 to the short blades 19, and the latter have their rear ends pivotally secured at 23 to pairs of flange plates 24 on the fixed plug 13. With reference to FIG. 2, it may be noted that the pivotal connections 22 between the long and short blades 18 and 19 of each blade unit are offset laterally outwardly with respect to the pivots 20 and 23 which are in alignment longitudinally when the blade units are retracted inside of the arrow shaft 10. This arrangement creates toggle joints in the blade units which collapse outwardly under the force of the tension element 16 when certain blade locking elements, to be described, are released. The outer longitudinal edges 25 of the blades 18 are sharpened to a knife edge, as shown.

In order to releasably secure the toggle-jointed blade units retracted inside of the arrow shaft 10, FIG. 2, small pivoted catch or locking elements 26 are mounted one each on the short blades 19 by pivot elements 27. The tips 28 of these catch elements project through the slots 12 and slightly beyond the periphery of the arrow shaft 10 when the catch elements are in the blade positions shown in FIG. 2. When in such positions, lateral locking fingers 29 on the catch elements 26 enter inclined slots 30 in the rear of the blades 18 to releasably lock the same in their retracted positions shown in FIG. 2. Even when the blades are fully re-

tracted their sharpened edges 25 project into the slots 12 and this prevents any rotation of the movable plug 14 in the bore of the arrow shaft. The blades 18 and 19 of each unit are freely movable within the slots 12 while shifting to and from the expanded blade position. Even when the blades are fully expanded or extended, FIG. 3, they are still subjected to the tension force of the resilient elements 16 and this tension force increases by stretching of the elements 16 when the blade units are retracted. When the blades 18 are extended by release of the catches 26, substantially the entire lengths of the knife edges 25 are exposed outwardly of the arrow shaft for maximum shock and killing power. In this connection, it is possible for the blades 18 to be much longer than the blades of conventional fixed arrow heads since the blades 18 offer no wind resistance when retracted inside of the arrow shaft 10.

In use, the hunger forces the blades of the arrow to the retracted position and sets the catches 26 in the locking positions shown in FIGS. 2 and 6. The geometry of the pivots 20, 22 and 23 in relation to the pivots 27 of the catches is such that the catches will hold the blade units retracted until the catches are released by the arrow entering the hide of the animal. When the arrow is shot by the hunter while the blades are retracted, it will strike the animal with maximum velocity and force and the tip 11 will pass through the hide with ease. The projecting tips 28 of the catches will encounter the hide and will be turned on their pivots 27 to the release positions shown in FIG. 3 where the force of the elastic elements 16 will be released to quickly shift the blades to their active expanded positions. When this takes place, the blades are already inside of the rib cage of the animal and the expanded blades are now positioned to quickly kill by damage in the heart and lung region or other vital region.

FIG. 7 shows an end view of a hunting arrow having three expandable and retractable blade units 18' according to the invention, and FIG. 8 shows an embodiment where the arrow has only a pair of the expandable and retractable blade units 18a. In all other respects the embodiments of FIGS. 7 and 8 are identical to the embodiment described in connection with FIGS. 1 through 6 showing an arrow having four blade units.

It is to be understood that the forms of the invention herewith shown and described are to be taken as preferred embodiments of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention or scope of the subjoined claims.

I claim:

1. A hunting arrow comprising an arrow shaft which is at least in part tubular and provided in its side wall with a plurality of circumferentially spaced longitudinal slots, fixed plug and an axially movable plug mounted within the bore of the tubular arrow shaft near said

slots, plural blade units corresponding in number to said slots and each blade unit having pivotally connected sections to form a toggle joint in each unit, the ends of the blade sections of each unit pivotally connected with said plugs, resilient tensioning means interconnecting said plugs and constantly urging the movable plug toward the fixed plug, and pivoted catch elements on the blade units having tips projecting through said slots and slightly outwardly of the periphery of said arrow shaft, said catch elements and blade units having interlocking parts adapted to hold the units releasably retracted bodily inside of the arrow shaft with only the tips of the catch elements projecting radially outwardly therefrom.

2. The structure of claim 1, and each blade unit comprising a relatively long blade having a sharpened outer longitudinal edge and a relatively short blade, the long blade of each unit being pivoted to the movable plug and the short blade being pivoted to the fixed plug.

3. The structure of claim 2, and the long and short blades of each blade unit having longitudinally aligned pivotal connections with said plugs and having toggle joint pivots between the long and short blades which are spaced laterally outwardly of the aligned pivots.

4. The structure of claim 3, and said fixed and movable plugs having pairs of spaced flange plates on their interior opposed ends with each pair of said flange plates receiving the ends of one blade unit pivotally therebetween.

5. The structure of claim 1, and said resilient tensioning means comprising elastic bands extending between said plugs and intervened circumferentially between the blade units within the tubular arrow shaft.

6. The structure of claim 5, and attaching hook elements on said plugs engageable with the opposite ends of said elastic bands.

7. The structure of claim 1, and said interlocking parts comprising angled slots in the rear ends of the forward blade sections of said units, and angled locking fingers projecting from corresponding sides of the catch elements and adapted to enter said angled slots lockingly when the catch elements are positioned radially of the arrow shaft with their tips projecting outwardly through the longitudinal slots of the arrow shaft.

8. The structure of claim 1, and said longitudinal slots and blade units being four in number and spaced equidistantly circumferentially of the arrow shaft.

9. The structure of claim 1, and said longitudinal slots and blade units being three in number and being spaced equidistantly circumferentially of the arrow shaft.

10. The structure of claim 1, and said longitudinal slots and blade units being a pair of slots and blade units arranged at diametrically opposite points on the arrow shaft.

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