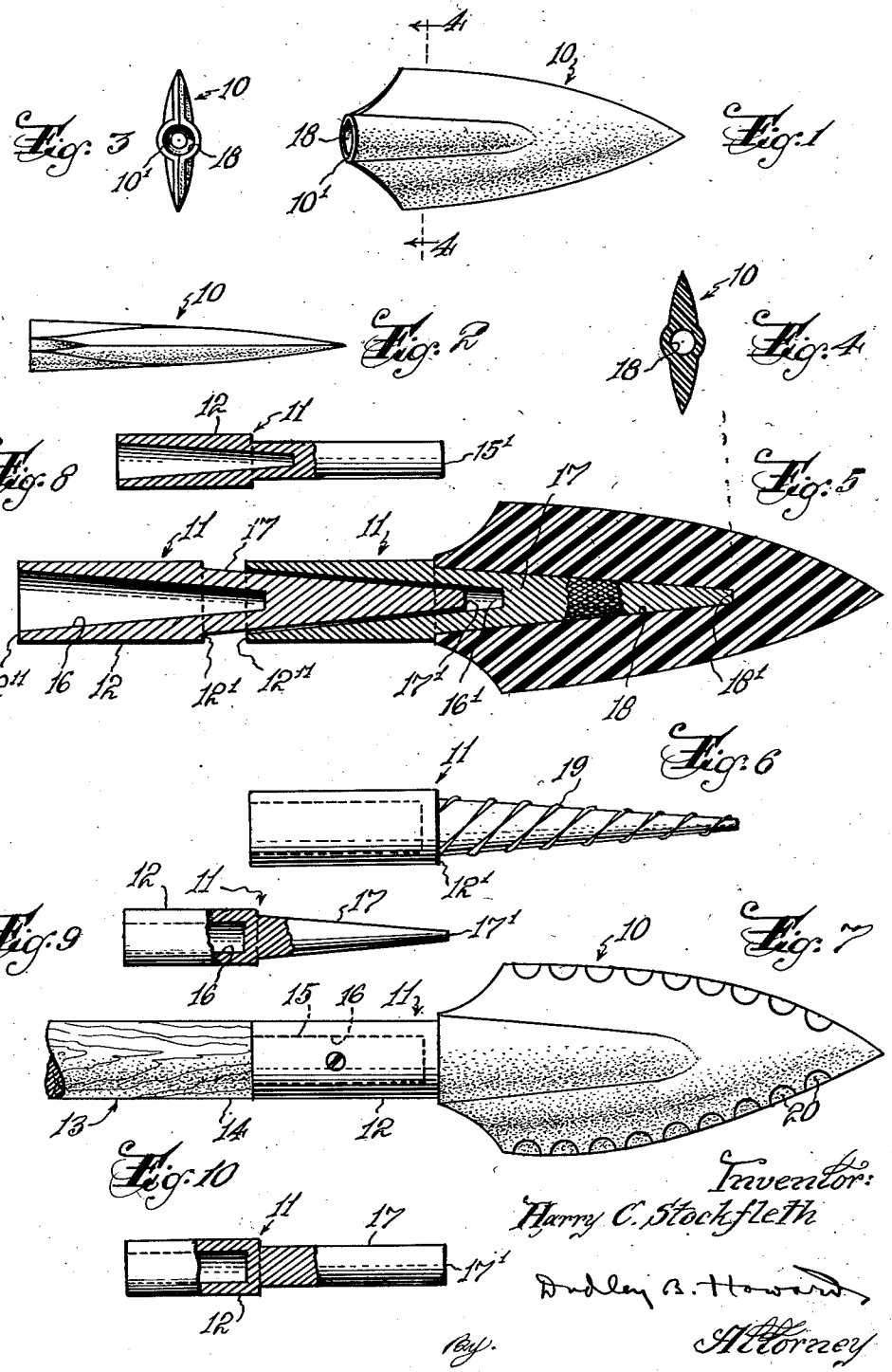
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WEIGHT-COMPENSATED ARROWHEAD

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WEIGHT-COMPENSATED ARROWHEAD

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1 Claim. (Cl. 273—106.5)

The invention relates in general to arrowheads used in archery and has particular reference to those of the broadhead type used in hunting live game or in target practice of a kind best suited to development of hunting accuracy.

Prior to my present invention, the most popular hunting arrowheads usually have been made from steel sheet or plate stock. Because any arrowhead of this type must have a comparatively thin blade portion of V-shaped outline and a base socket portion of sufficient lateral thickness to fit the foot of an arrow shaft, the blade and socket portions generally have had to be pressed from undesirably thin, soft stock when made in one piece. However, the best sheet steel arrowhead of which I am aware is composed of more than one piece which are united by spot-welding. The V-shaped blade portion is punched out of comparatively thick and hard plate stock, whereas the socket portion is pressed out of thinner and more pliable sheet stock. The result is an expensive arrowhead which sometimes separates into its component parts when the shock of target impact is too much for the spot-welding to withstand.

With the above mentioned disadvantages of the arrowheads that are made from sheet metal in mind, it has been my purpose to devise an arrowhead that can be molded from some substance, metallic or otherwise, which will be sufficiently hard for target penetration without having to add any cost-increasing treatment following the molding step of the production process. After preliminary experiments with various metals, it was discovered that nylon can be molded into an arrowhead that is suitably hard. This substance is peculiarly adapted for the intended use because it is a thermoplastic that hardens as it cools in the mold and also because it can be colored for purposes of identification.

Nylon and other thermoplastics which might otherwise be suitable have one disadvantage which it is an object of the present invention to overcome. That is its light weight in comparison with steel or other metals of sufficient hardness.

It may be explained that balance is important in arrow construction. A target arrow, for instance, usually has its weight distributed from end to end so that the center of gravity is located at a point one and one-half to two inches in front of the geometrical center. In hunting arrows, the center of gravity may be located even further forward. This means that a lighter-than-metal head cannot be applied to a standard shaft such as is now available on the market without disturbing the desired over-all balance.

Therefore, I have supplemented my discovery of the suitability of moldable thermoplastic substances such as nylon by the invention of simple, inexpensive means to effect weight compensation when the lighter-than-metal arrow is fitted to a standard shaft.

To be more explicit, I have solved the problem of weight compensation by providing a metallic member to be added to the light arrowhead to increase the combined

weight to that of the metallic arrowhead for which the standard shaft is designed.

It is a further object of the invention to provide a weight-compensation member which is constructed so that it serves also as the means for connecting the arrowhead to the shaft in a strong, accurately aligned manner.

Another object of the invention is to provide a weight-compensation member that can be changed in weight readily by the using archer for minute balance adjustment, or which can be supplemented by the addition of one or more identical weight-compensation members whenever it is desired to make a large change in weight. For instance, the addition of a single weight-compensation member to a plastic head might afford just the right balance for target shooting when the head and said member are applied to a shaft of standard design and weight. If the arrow proves to be slightly point-heavy, however, some of the metal can be filed or ground off the rear end of the weight-compensation member until the balance is corrected. On the other hand, for hunting with a heavy bow and with arrow shafts having heavy feather fletching, it may be desirable to resort to the use of at least one supplemental weight-compensation member.

The foregoing and other objects, advantages and features of the invention will be more fully understood as the following specific description is read in connection with the accompanying drawings, in which:

Fig. 1 is a side perspective view of an arrowhead constructed in accordance with the invention by molding plastic material such as nylon; Fig. 2 is a plan view of the same; Fig. 3 is a rear elevation; and Fig. 4 is a transverse vertical section on line 4—4 of Fig. 1.

Fig. 5 is an enlarged view, mostly in vertical section, of the arrowhead represented in Figs. 1 to 4, with a weight-compensation member completely assembled with the former and a supplemental weight-compensation member partially inserted in the first member.

Fig. 6 is an enlarged side elevation of a modified form of weight-compensation member.

Fig. 7 is an enlarged side elevational view of a modified form of arrowhead having the form of weight-compensation member represented in Fig. 6 affixed to an arrow shaft, which latter is shown broken away.

Figs. 8, 9 and 10 are full-scale side elevations, partially broken away, of respective further modified forms of the weight-compensation member.

Referring now in detail to the drawing, in which like reference characters designate corresponding parts in the several views, Figs. 1 to 5 disclose the preferred embodiment of the invention which comprises two fundamental components, viz: arrowhead 10 and weight-compensation member, or element, 11, which latter will be termed hereinafter, for the sake of brevity, the "insert."

In accordance with the present inventive concept, already explained, arrowhead 10 may be made of any substance which, when mold into the desired shape and allowed to cool under normal conditions, will have the degree of hardness required for target penetration, without being subjected to any added step in the production process. There may be metals that will meet this requirement. However, in the interest of sharp cost reduction, particularly, I choose to use a thermoplastic substance, which can be formed into an arrowhead by simple injection molding process and will harden as it cools from the temperature of its molten state to room temperature. Of the substances in this category with which I have experimented nylon is preferred, although glass is a satisfactory substitute. In fact, glass can have its weight increased by addition of a metallic substance, such as lead, by mixing the latter therewith while both components are in a molten state.

"Nylon" is not a trademark but is a generic term for

any long-chain synthetic polymeric amide which as recurring amide groups as an integral part of the main polymer chain, and which is capable of being formed into a filament in which the structural elements are oriented in the direction of the axis. In general, nylon is characterized by high rigidity, toughness, abrasion-resistance, strength in thin sections, chemical-resistance, and lightness in weight, when in a solid state, and by heat-resistance, form-stability, and high fluidity at molding temperatures. Unlike most thermoplastics, which are amorphous, nylon is a crystalline material and is much harder, but is tough and hornlike rather than brittle in nature. Of especial interest in connection with arrowhead manufacture, nylon has high impact strength, and this property is maintained at sub-zero temperatures to a greater extent than in plasticized molding compositions. Also, nylon possesses excellent low-temperature flexibility, even at temperatures below −60° F.

The natural color of articles molded from the various nylons ranges from cream to light amber. Any special coloration may be obtained by immersing the finished article in a boiling water solution of such dies as those sold for household dyeing of nylon fabrics. Colors obtained by this method are resistant to boiling water and hot, soapy water and obviously will withstand the conditions to which an arrowhead will be subjected in normal use. The advantage of being able to use colored arrowheads lies in the certainty of identification. For example, an archer who has dyed his arrowheads a chosen individual color should have no trouble in claiming a game kill even after the animal or fowl has been found by other hunters. The arrow shaft may have been broken off so that the identification marking thereon has been lost, but the arrow head will be embedded in the game creature for positive identification upon being extracted.

As compared with manufacture from sheetmetal, a molded arrow head can be given smooth streamline form along the large area surfaces of its cutting blade portion, as will be evident from inspection of Fig. 2. In this way, the drag influence in flight will be reduced to a minimum and therefore greater velocity will be gained.

Referring now to specific structural details of the arrowhead and weight-compensation means, insert **11**, which constitutes the said weight-compensation means, includes a preferably cylindrical body portion **12** of substantially the same cross-sectional form and size as that of the arrow shaft **13** (Fig. 7) to which it is to be applied. In preparation for application of insert **11**, the foot **14** of shaft **13**, which usually in hunting arrows is made of harder wood than the main portion of said shaft, is reduced in diameter to provide an attaching shank **15** of suitable shape to fit within a socket **16** which is provided in the rear end of body portion **12** of said insert. As shown in Fig. 7, attaching shank **15** of shaft **13** is cylindricarl in form to fit the socket **16** of corresponding shape in the modified insert **11** shown. However, if the preferred form of insert **11** shown in Fig. 5 is to be used, the arrow shank **15** will have to be tapered (not shown) to fit the tapered socket **16** of said insert.

The front end of insert **11** has an attaching shank **17** projecting forward in true alignment with the axis of body portion **12** thereof for engagement within an axial socket **18** provided, during the molding process, in the base of arrowhead **10**. Due to the forwardly tapering shape of the external surfaces of arrowhead **10**, it is preferred to make socket **18** tapered in form, as shown in Fig. 5. That is why the preferred form of insert **11** has its shank **17** correspondingly tapered.

In order to insure a tight fit between shank **17** of insert **11** and socket **18** of arrowhead **10**, the longitudinal face of said shank may be knurled as shown in Fig. 5 or may be provided with a preferably high-pitch cutting thread **19** as shown in connection with the modified insert structure in Fig. 6. When a thread is employed, it should have the same direction of twist as fletching feathers of the arrow shaft with which the arrowhead is to be used, which usually is left-hand in form, in order that said threads will tend to cut more deeply and tightly into the arrowhead socket walls when rotational motion of the head is retarded by target impact and penetration.

To avoid damage to arrowhead **10** by the shock of impact, the bottom of socket **18** should be truncated to provide a perpendicular abutment face **18'** for limiting contact with a similar abutment face **17'** formed by truncation of the forward end of shank **17** of insert **11**. For the same purpose, body portion **12** of insert **11** should be provided at the plane of juncture between said body portion and shank **17** with an annular shoulder **12'** for limiting abutment against the base of the arrowhead. Consequently, when a supplemental insert of identical construction is applied to the principal insert in the manner illustrated in Fig. 5, shoulder **12'** of the former will abut the shoulder **12''** formed at the rear end of the former surrounding the mouth of socket **16**.

Weight compensation for arrowhead **10** can be achieved by the addition of a very light insert **11**, so it is entirely practicable to make the latter of aluminum or magnesium, either of which has the advantage of being easily and quickly reduced in weight by filing or grinding to effect minute arrow balancing adjustments. Such filing or grinding can be done at the rear end of body portion **12** to best advantage.

While it is preferred to provide insert **11** with tapered sockets **16** and shanks **17** of identical form, it is within the scope of the present invention to vary the form of these sockets and shanks. Examples of such variation are disclosed in Figs. 6 to 10, inclusive. Figs. 6, 7 and 9 show a cylindrical socket combined with a tapered shank, whereas Fig. 8 shows a reversed arrangement in which the socket is tapered and the shank is cylindrical. Fig. 10 on the other hand discloses socket and shank which are both cylindrical. While all the exemplary sockets and shanks are shown to be circular in cross-section, a non-circular cross-sectional configuration (not shown) could be employed within the scope of the invention and would serve the additional purpose of preventing relative rotational displacement of the coupled members.

By providing arrowhead **10** with a marginal row of depressions or indentations **20** on both sides of each cutting edge penetration of a target will be increased due to sawing action. This feature is illustrated in Fig. 7.

The practicability of making weight adjustments other than the weight-compensation for the light arrowhead initially required to attain proper balance in the arrow as a whole can be taken advantage of in certain distinct classes of archery shooting. For instance, in clout shooting, wherein high angle shots are aimed at a horizontal target marked out on the ground at ranges of from 120 to 180 yards, it is considered best practice to utilize a relationship of bow weight to arrow weight that will cause the arrow to fly just to the target when launched at an angle of elevation of approximately 45 degrees. This means that an archer who contemplates entering in a clout shooting contest must obtain at extra cost a special bow for the event, under ordinary circumstances. With my invention in his possession, the archer merely has to effect arrow weight adjustment in relation to whatever bow he has available. This may be accomplished in relation to some bows by filing or grinding down the rear end of a single weight-compensation insert, when weight reduction is required, or by adding a supplemental insert and possibly reducing its weight somewhat by filing or grinding, when more total weight is required. Bearing in mind the fact that each insert may weight only a small fraction of an ounce, when made of very light metal, very precise plus or minus refinements in weight adjustment may be applied to an arrow for the suggested purpose. In the same way, weight adjustments may be made for flight shooting for distance, or for hunting with the usual high-weight bows.

It is to be understood that the present disclosure of the invention is an illustrative example and that various changes, modifications and alterations may be made in this structural embodiment which do not constitute departures from the spirit and scope of the invention.

Having thus described the invention, I claim:

A weight-compensated arrowhead comprising: a head proper composed of a comparatively light material having a forwardly tapered socket in the rear end thereof; and a weight-compensation member of comparatively heavy material having an axial shank at its forward end shaped and axially dimensioned to fit the socket in the head proper, said weight-compensation member being provided in its rear end with an axial shaft-engaging socket corresponding in shape and axial dimensions with the shank of said member to permit nested assembly of plural weight-compensation members with the head proper and an arrow shaft for weight adjustment.

References Cited in the file of this patent

UNITED STATES PATENTS

1,374,420	Bergreen	Apr. 12, 1921
2,179,404	Fabionar	Nov. 7, 1939
2,213,637	Osgood	Sept. 3, 1940
2,279,833	Madan	Apr. 14, 1942
2,289,284	Chandler	July 7, 1942
2,309,729	Gordon	Feb. 2, 1943
2,350,581	Boose	June 6, 1944
2,486,952	Kearsley	Nov. 1, 1949
2,555,214	Wallach	May 29, 1951
2,613,936	Dalton	Oct. 14, 1952
2,629,600	Edmonds	Feb. 24, 1953
2,676,017	Selent	Apr. 20, 1954
2,681,096	Semegen	June 16, 1954
2,684,852	Romeka	July 27, 1954
2,686,055	Peltz	Aug. 10, 1954

FOREIGN PATENTS

589,629	Great Britain	June 25, 1947