PROJECTILES WITH LIGHT TRANSMISSIVE TIPS

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ABSTRACT
A projectile according exemplary embodiments generally includes a body. The body has a generally cylindrical proximal portion and an ogival distal portion terminating at a distal rim. The ogival distal portion includes a distal-facing aperture extending inwardly from the distal rim into the body. The projectile also includes a nose element. The nose element has a proximal section extending at least partially into the distal-facing aperture, and an ogival distal section external to the distal-facing aperture. At least a portion of the nose element is at least partially light transmissive through which at least some ambient light is transmissible and visually perceptible to an observer.
PROJECTILES WITH LIGHT TRANSMISSIVE TIPS
CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 11/011,318 filed Dec. 13, 2004, the disclosure of which is incorporated herein by reference.

FIELD

[0002] The present disclosure relates to projectiles having light transmissive tips.

BACKGROUND

[0003] The statements in this section merely provide background information related to the present disclosure and may not constitute prior art.

[0004] Bullets are commonly provided with plastic tips as a means for improving ballistic coefficient. By way of example, bullets having plastic tips can be found in rifle, handgun, and shotgun ammunition. Bullets having plastic tips can also be found in centerfire, rimfire, and muzzle-loader ammunition.

SUMMARY

[0005] In various exemplary embodiments, a projectile generally includes a body. The body has a generally cylindrical proximal portion and an ogival distal portion terminating at a distal rim. The ogival distal portion includes a distal-facing aperture extending inward from the distal rim into the body. The projectile also includes a nose element. The nose element has a proximal section extending at least partially into the distal-facing aperture, and an ogival distal section external to the distal-facing aperture. At least a portion of the nose element is at least partially light transmissive through which at least some ambient light is transmissible and visually perceptible to an observer.

[0006] In other exemplary embodiments, a projectile generally includes a light transmissive tip at a distal end portion of the projectile through which at least some ambient light is transmissible and visually perceptible to an observer.

[0007] Additional exemplary embodiments include a nose element for a projectile. In such embodiments, the nose element includes at least a portion that is at least partially light transmissive through which at least some ambient light is transmissible and visually perceptible to an observer.

[0008] Other aspects of the present disclosure relate to methods of enhancing the cosmetic appearance of projectiles. In various exemplary embodiments, the method generally includes coupling to a projectile’s body a tip having at least a portion that is at least partially light transmissive through which at least some ambient light is transmissible and visually perceptible to an observer.

[0009] Further aspects and features of the present disclosure will become apparent from the detailed description provided hereinafter. In addition, any one or more aspects of the present disclosure may be implemented individually or in any combination with any one or more of the other aspects of the present disclosure. It should be understood that the detailed description and specific examples, while indicating exemplary embodiments of the present disclosure, are intended for purposes of illustration only and are not intended to limit the scope of the present disclosure.

DRAWINGS

[0010] The drawings described herein are for illustration purposes only and are not intended to limit the scope of the present disclosure in any way.

[0011] FIG. 1 is a perspective view of a projectile having a light transmissive nose element according to exemplary embodiments;

[0012] FIG. 2 is an exploded frontal perspective of the projectile shown in FIG. 1 with the light transmissive nose element shown exploded away from the body of the projectile;

[0013] FIG. 3 is an exploded rearward perspective view of the projectile shown in FIG. 2;

[0014] FIG. 4 is a perspective view of the projectile shown in FIG. 1;

[0015] FIG. 5 is a back perspective view of the projectile shown in FIG. 4;

[0016] FIG. 6 is a front end elevation view of the projectile shown in FIG. 1; and

[0017] FIG. 7 is a back end elevation view of the projectile shown in FIG. 1.

DETAILED DESCRIPTION

[0018] The following description is merely exemplary in nature and is in no way intended to limit the present disclosure, application, or uses.

[0019] Bullets are commonly provided with plastic opaque tips for improving ballistic coefficient. In addition to improving ballistic coefficient, the inventors hereof have recognized that a bullet tip can be selectively configured to provide a cosmetic or aesthetic enhancement to a bullet. In this regard, the inventors hereof have recognized that even though some existing bullet tips are available in different colors, these existing bullet tips are opaque. The inventors have further recognized that a bullet’s cosmetic or aesthetic appearance (and possibly commercial appeal) can be enhanced by providing the bullet with a tip or nose element having at least a portion that is at least partially light transmissive. Accordingly, the inventors hereof have developed various tips and nose elements with at least a portion that is at least partially light transmissive. When such a tip or nose element is provided to a bullet, at least some ambient light can pass through the light transmissive portion of the tip or nose element and be visually perceptible to an observer (e.g., user, customer, purchase, etc.). In turn, this light transmissibility can provide a cosmetic or aesthetic enhancement to the bullet (or other projectile).

[0020] In various embodiments, the tip or nose element can also be configured for improving performance of a projectile, such as ballistic coefficient, improved damage resistance during loading and unloading, and/or consistent expansion of a hollow point design at a wide range of velocities. In such cases, the tip or nose element can enhance both the cosmetic appearance and performance of the projectile.
In various embodiments, at least a portion of the nose element or tip can be aesthetically colored. In some embodiments, the entire nose element or tip is both aesthetically colored and light transmissive. By way of example only, one such embodiment includes a nose element or tip made entirely from red translucent polycarbonate.

Alternative embodiments include a nose element or tip having only a portion that is aesthetically colored. In such embodiments, the aesthetically colored portion may also be light transmissive, or it may be opaque. For example, one exemplary embodiment includes aesthetic coloring of only the portion of the nose element or tip (e.g., an ogival distal portion, etc.) of the nose element or tip that is external to the projectile and thus visible to an observer.

In further embodiments, the entire nose element or tip is aesthetically colored, but only a portion of the nose element or tip is light transmissive. By way of example, one such embodiment includes a nose element or tip having a first red opaque portion and a second red translucent portion.

In still other embodiments, the entire nose element or tip is light transmissive, but only a portion of the nose element or tip is aesthetically colored. By way of example only, one such embodiment includes a nose element or tip includes a first portion made of a red translucent material, and a second portion made of a colorless transparent or clear material.

The aesthetic coloring can depend, for example, on user preferences. A nose element or tip (or portion thereof) can be aesthetically colored in any of a wide range of colors (e.g., red, blue, orange, yellow, green, cyan, blue, indigo, violet, a non-metallic color that is not a natural color or luster of a metal, combinations thereof, etc.). In some embodiments, a nose element or tip (or portion thereof) can also include one or more special effect pigments or characteristics, including luminescence, photochromic pigments, thermochromic pigments, phosphorescent pigments, glitter (e.g., metal flakes, etc.), among other possible light-producing means, light-altering means, special effect pigments or characteristics. In some embodiments, the nose element or tip may include two or more aesthetically colored portions in different colors and/or in different color patterns, such as stripes, swirls, over-and-under colored layers, combinations thereof, etc.

In combination with the light transmissibility, the aesthetic coloring can further enhance the cosmetic appearance of the nose element or tip (and the projectile provided therewith). For example, one exemplary embodiment includes a nose element or tip formed entirely from red translucent polycarbonate that is provided to a projectile having a body with a black exterior surface. In this particular embodiment, ambient light passing through the red translucent polycarbonate nose element or tip can provide a colorful glow or enhancement. That colorful glow can make the polycarbonate tip more readily discernible from the projectile body, thereby also possibly enhancing the commercial appeal for such a projectile.

The light transmissibility and/or aesthetic coloring can also provide other benefits. For example, the light transmissibility and/or aesthetic coloring can allow a user to personalize or customize his ammunition by selecting ammunition having nose elements or tips with a particular light transmissibility (e.g., transparent, translucent, combinations thereof, etc.), color, and/or with particular portions being light transmissive and/or aesthetically colored. As another example, a first type of ammunition can be provided with red translucent tips such that it is more readily distinguishable from a second type of ammunition having blue translucent or opaque tips, from a third type of ammunition without any plastic tips, etc.

In some embodiments, a nose element or tip can also be provided with indicia positioned to receive and be highlighted (e.g., back lit, etc.) by light passing through the light transmissive portion of the nose element or tip. The indicia may be at least partially opaque, translucent, transparent, or a combination thereof. The indicia may include any of a wide range of symbols, characters, shapes, words, logos, combinations thereof, etc. By way of example, the indicia may include the name of the manufacturer and/or the type of ammunition. The indicia may be provided using various means, including transfer decals, painting, etching, etc.

In some embodiments, the external surface of a nose element or tip can be frosted, for example, to diffuse or soften the light passing through the light transmissive portion the nose element or tip. Additionally, or alternatively, some embodiments may also include a nose element or tip with at least one faceted surface, such as a faceted internal surface which will not otherwise affect the ballistics of the projectile. Additionally, or alternatively, other embodiments of the nose element or tip include other surface treatment and/or depth treatment for altering the light (e.g., refracting, reflecting, diffracting, dispersing, diffusing, combinations thereof, etc.), for example, to further improve the cosmetic enhancement provided by way of the light transmissibility of the tip or nose element (or portion thereof).

A wide range of materials and manufacturing processes can be used for making the various nose elements and tips disclosed herein. Various exemplary embodiments include nose elements and tips made of red translucent polycarbonate and formed via a suitable molding process (e.g., injection molding, etc.) or other process. Alternatively, other embodiments include nose elements and tips formed from other materials and in other colors, including clear materials, transparent materials, translucent materials, among other suitable materials that allow at least portion of ambient light to transmit therethrough.

In addition, the materials forming the nose elements and tips can also be relatively soft such that the projectile with the nose element attached thereto has the requisite softness to facilitate expansion of a hollow point projectile at relatively low velocities (e.g., 2800 feet per second, etc.). Additionally, or alternatively, the materials forming the nose elements and tips can also be relatively tough or damage resistant, such that they help resist damage to the projectile when loading to and unloading from a rifle or other gun.

In addition, some embodiments include nose element and tips formed from two or more materials. By way of example, one such embodiment includes a nose element or tip having a proximal section made of an opaque material, and a distal ogival section made of an aesthetically colored translucent material. Continuing with this example, the nose element or tip may be formed via molding two different
materials, and then adhesively bonding (or otherwise attaching) the proximal section to the ogival distal section. 

Accordingly, aspects of the present disclosure relate to nose elements and tips having at least a portion that is at least partially light transmissive through which at least some ambient light is transmissible and visually perceptible to an observer. This light transmissibility can provide a cosmetic enhancement to the nose elements and tips, and the projectiles provided therewith. Other aspects of the present disclosure relates to projectiles (e.g., bullets, shells, explosive-filled projectiles, shots, non-explosive projectiles, etc.) and ammunition (e.g., rifle, handgun, shotgun, centerfire, rimfire, and/or muzzleloader ammunition) provided with nose elements and tips having at least a portion that is at least partially light transmissive. Further aspects relate to methods for enhancing the cosmetic appearance of projectiles. 

CALIBERS GRAIN WEIGHTS

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By way of further example, the various nose elements and tips disclosed herein can be used with a projectile described in pending U.S. patent application Ser. No. 11/011,318 titled “Projectile with Blended Rear Core”. Alternatively, any one or more of the nose elements and tips described herein can be used with a wide range of other projectiles. 

FIGS. 1 through 7 illustrate an exemplary projectile 100 having a nose element or tip 104 embodying one or more aspects of the present disclosure. As shown, the nose element 104 can be provided or disposed at a distal end portion of a body 108 of the projectile 100. 

In this particular embodiment, the nose element or tip 104 is made from red translucent polycarbonate. Alternative embodiments, however, can include nose elements and tips formed from other materials having different light transmissibility and/or colors. 

As shown in FIG. 1, at least a portion of the incident light waves, referenced at 112, impinging upon the exterior surface 116 of the nose element 104 is transmitted therethrough. Depending upon the particular configuration of the nose element 104 (e.g., light transmissibility, aesthetic coloring, surface and/or depth treatment, indicia, etc.), ambient light having a certain frequency (or within a frequency range) can be reflected back or be absorbed by the nose element 108. The remaining light can travel through the nose element 104 and be visually perceptible to an observer's eye. This, in turn, can provide an aesthetic or cosmetic enhancement for the projectile 100. 

In addition to the cosmetic and aesthetic enhancements, the nose element 104 may also be configured to provide one or more performance improvements. For example, in this illustrated embodiment, the nose element 104 includes an ogival distal section 124 terminating in a point 128 at the distal end thereof. This ogival-shaped section 124 can increase the ballistic coefficient of the projectile 100 and improve downrange performance. Inclusion of the nose element 104 decreases the meplat size of the projectile 100 and helps lower the overall form factor (i) of the projectile 100, thereby increasing the ballistic coefficient (C) (C=wd^2, where d is the diameter of the projectile, and w is the weight of the projectile). An increase in the ballistic coefficient increases downrange velocity, which in turn decreases the size of the velocity window for which the projectile must upset. This can be beneficial by increasing the overall performance of the projectile over a larger range of distances from the barrel muzzle since the projectile is more aerodynamic and loses speed at a slower rate. 

The sharpness and/or type of ogival shape defined by the nose element 104 can vary depending, for example, on the particular type of ammunition. By way of example only, the nose element 104 may include an ogival distal section 124 having a sharpness value ranging from about four to about ten, such as when the nose element 104 is configured for use with rifle ammunition. As other examples, the nose element 104 may include an elliptical or secant ogival distal section 124, such as when the nose element 104 is configured for use with pistol ammunition. Alternatively, the nose element 104 may be configured such that it defines an ogival distal section having a different sharpness value (e.g., less than four, greater than ten, etc.) and/or having a different type of ogive (e.g., spitzer, etc.). By way of further example, some embodiments include nose elements and tips having a relatively flat forward portion (e.g., wadcutter, semi-wadcutter, etc.) and/or a rounded nose configuration. 

As shown in FIGS. 2 and 3, the illustrated projectile body 108 includes a generally cylindrical proximal portion 144 and an ogival distal portion 148 terminating at a distal rim 152. The distal-facing aperture 136 extends inwardly from the distal rim 152 into the body 108. In this particular embodiment, the distal-facing aperture 136 comprises a longitudinally extending cylindrical passage having a uniform circular cross-section. Alternatively, other types of apertures and/or passages having different cross-sectional shapes can be used in other embodiments. 

The proximal section 132 of the nose element 104 comprises a generally cylindrical shaft or shank 156 having a uniform circular cross-section. Alternatively, other cross-sectional shapes can also be used for the shaft 156. 

The shaft 156 is configured to engagingly interfit within the passage 136 into the projectile body 108. In
various embodiments, the shaft 156 is dimensionally sized slightly larger than the cavity 136 extending into the projectile body 108. In such embodiments, the shaft 156 can then be press fit into the cavity 136 to thereby attach the nose element 104 to the projectile body 108. By way of example only, the shaft 156 may have an outer diameter that is about five-thousandths of an inch larger than the diameter of the cavity 136. Alternatively, other means for attaching the nose element 104 to the projectile body 108 can be employed, such as mechanical crimping, adhesive bonding, chemical bonding, threading, resilient ribs, combinations thereof, etc. In addition, other embodiments can include a nose element or tip without any shaft or Shank configured to engageably interfit within an aperture or cavity of the projectile body. In such alternative embodiments, the nose element or tip can be bonded (e.g., adhesively bonded, etc.) to a forward portion of the projectile body without inserting any portion of the nose element or tip into the projectile body.

[0045] With continued reference to FIG. 3, the nose element 104 includes a proximal-facing shoulder 160 intermediate the proximal and distal ends of the nose element 104. When the shaft 156 is fully engaged or inserted into the passage 136, the shoulder 160 substantially abuts against the distal rim 152 of the projectile body 108. This abutting contact can help create a relatively smooth transition from the nose element 104 to the projectile body 108, which, in turn, can enhance the ballistic coefficient of the projectile 100.

[0046] In this particular embodiment, the entire nose element 104 is integrally or monolithically formed (e.g., via molding, etc.) from red translucent polycarbonate. Accordingly, the entire nose element 104 is light transmissive. In alternative embodiments, the proximal section 132 and ogival distal section 124 of the nose element 104 may be formed from different materials. By way of example, one such embodiment includes the proximal section 132 being made of an opaque material, and the distal ogival section 124 being made of an aesthetically colored translucent material. Continuing with this example, the proximal section 132 and ogival distal section 124 may be separately formed via molding, and then attached to one another, such as by adhesive bonding, welding (e.g., solvent welding, ultrasonic welding, laser welding, radio frequency welding, thermal welding, etc.), combinations thereof, etc. As other examples, various embodiments include one-piece tips or nose elements formed via two shot molding or coinjection molding, where the resulting one-piece tips can include various combinations of opaque, translucent, and/or transparent portions. Alternatively, other suitable materials and manufacturing processes can be used for making any one or more of the various disclosed nose elements and tips (or portions thereof).

[0047] Furthermore, the projectile body can also be provided or coated with an oxide lubricant, for example, to help reduce barrel fouling, pressure, and friction between projectile body and bore of gun barrel, improving accuracy over long shooting sessions, providing longer barrel life, and/or easier barrel cleaning. In one exemplary embodiment, the projectile body 108 is provided or coated with Lubalox® oxide lubricant, which, in turn, also renders the exterior surface of the projectile body 108 black.

[0048] Other embodiments include projectiles having one or more other light transmissive portions (e.g., body, sabot, etc.) in addition to having nose elements or tips, which include at least a portion that is at least partially light transmissive. Further embodiments include projectiles having one or more light transmissive portions (e.g., body, sabot, etc.), but which do not include any nose element or tip with at least a portion that is at least partially light transmissive.

[0049] Certain terminology is used herein for purposes of reference only, and is not intended to be limiting. For example, terms such as “upper”, “lower”, “above”, and “below” refer to directions in the drawings to which reference is made. Terms such as “front”, “back”, “rear”, “bottom”, and “side”, describe the orientation of portions of the component within a consistent but arbitrary frame of reference which is made clear by reference to the text and the associated drawings describing the component under discussion. Such terminology may include the words specifically mentioned above, derivatives thereof, and words of similar import. Similarly, the terms “first”, “second” and other such numerical terms referring to structures do not imply a sequence or order unless clearly indicated by the context.

[0050] When introducing elements or features of the present disclosure and the exemplary embodiments, the articles “a”, “an”, “the” and “said” are intended to mean that there are one or more of such elements or features. The terms “comprising”, “including” and “having” are intended to be inclusive and mean that there may be additional elements or features other than those specifically noted. It is further to be understood that the methods and the steps, processes, and operations thereof described herein are not to be construed as necessarily requiring their performance in the particular order discussed or illustrated, unless specifically identified as an order or performance. It is also to be understood that additional or alternative steps may be employed.

[0051] The description of the disclosure is merely exemplary in nature and, thus, variations that do not depart from the gist of the disclosure are intended to be within the scope of the disclosure. Such variations are not to be regarded as a departure from the spirit and scope of the disclosure.

What is claimed is:

1. A projectile comprising a body having a generally cylindrical proximal portion and an ogival distal portion terminating at a distal rim, the ogival distal portion including a distal-facing aperture extending inwardly from the distal rim into the body, and a nose element having a proximal section extending at least partially into the distal-facing aperture, and an ogival distal section external to the distal-facing aperture, at least a portion of the nose element being at least partially light transmissive through which at least some ambient light is transmissible and visually perceptible to an observer.

2. The projectile of claim 1 wherein substantially the entire ogival distal section of the nose element is light transmissive.

3. The projectile of claim 2 wherein substantially the entire nose element is light transmissive.

4. The projectile of claim 1 wherein substantially the entire nose element includes a proximal-facing shoulder intermediate the proximal and distal ends of the nose element, the proximal-facing shoulder substantially abutting against the distal rim of the projectile body.
body, thereby forming a relatively smooth transition from the nose element to the body.

5. The projectile of claim 1 wherein the ogival distal section of the nose element terminates in a point at the distal end thereof.

6. The projectile of claim 1 wherein the proximal section of the nose element comprises a generally cylindrical shaft, and wherein the distal-facing aperture of the body comprises a generally cylindrical passage configured to engagingly receive the generally cylindrical shaft.

7. The projectile of claim 1 wherein the nose element is made from at least one of a translucent and a transparent material.

8. The projectile of claim 1 wherein the nose element is made from a red translucent polycarbonate.

9. The projectile of claim 1 wherein at least a portion of the nose element is colored and visually perceptible to an observer.

10. The projectile of claim 9 wherein the colored portion is at least partially light transmissive.

11. The projectile of claim 1 wherein substantially the entire ogival distal section of the nose element is light transmissive and colored in the visible spectrum.

12. The projectile of claim 1 wherein substantially the entire nose element is light transmissive and colored in the visible spectrum.

13. The projectile of claim 1 wherein the nose element comprises at least one or more of a red portion, an orange portion, a yellow portion, a green portion, a cyan portion, a blue portion, an indigo portion, a violet portion, a portion having a non-metallic color, one or more special effect pigments, and glitter.

14. A projectile comprising a light transmissive tip at a distal end portion of the projectile through which at least some ambient light is transmissible and visually perceptible to an observer.

15. The projectile of claim 14 wherein the light transmissive tip is made from at least one of a translucent material and a transparent material.

16. The projectile of claim 14 wherein the light transmissive tip is made from a red translucent polycarbonate.

17. The projectile of claim 14 wherein the light transmissive tip includes an ogival portion terminating in a point at the distal end thereof.

18. The projectile of claim 14 wherein the light transmissive tip is colored in the visible spectrum.

19. The projectile of claim 14 wherein the light transmissive tip comprises at least one or more of a red portion, an orange portion, a yellow portion, a green portion, a cyan portion, a blue portion, an indigo portion, a violet portion, a portion having a non-metallic color, one or more special effect pigments, and glitter.

20. A nose element for a projectile the nose element comprising at least a portion that is at least partially light transmissive through which at least some ambient light is transmissible and visually perceptible to an observer.

21. The nose element of claim 20 wherein the nose element is made from at least one of a translucent and a transparent material.

22. The nose element of claim 20 wherein the nose element is made from a red translucent polycarbonate.

23. The nose element of claim 20 wherein at least a portion of the nose element is colored.

24. The nose element of claim 23 wherein the light transmissive portion comprises the colored portion.

25. The nose element of claim 20 wherein the light transmissive portion comprises at least one or more of a red portion, an orange portion, a yellow portion, a green portion, a cyan portion, a blue portion, an indigo portion, a violet portion, a portion having a non-metallic color, one or more special effect pigments, and glitter.

26. An ammunition round comprising the nose element of claim 20.

27. A method of enhancing the cosmetic appearance of a projectile having a body, the method comprising coupling to the body a tip having at least a portion that is at least partially light transmissive through which at least some ambient light is transmissible and visually perceptible to an observer.

28. The method of claim 27 wherein substantially the entire tip is light transmissive.

29. The method of claim 27 wherein the tip is colored in the visible spectrum.

30. The method of claim 27 further comprising providing a first type of projectile with a first tip configuration, and providing a second type of projectile with a second tip configuration, the first and second tip configurations including at least one of a different color and a different light transmissibility to thereby differentiate between the first and second types of projectiles.

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