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(54) **LIGHTED PROJECTILE**

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(57) **ABSTRACT**

A projectile illuminated by a chemiluminescent light source is capable of producing a stroboscopic effect when set in motion. The projectile body is a solid body preferably made of a soft, pliable material such as NERF®, in the shape of a sports ball, and the light propagates, unobstructed, through orifices in the body that allow for maximum light transmission. There need not be any ancillary components, only the light stick(s) and the soft, pliable body, however, an optional housing may be included to contain the light source. Orifices through which the light escapes the body may be modeled in the shape of team or corporate logos.

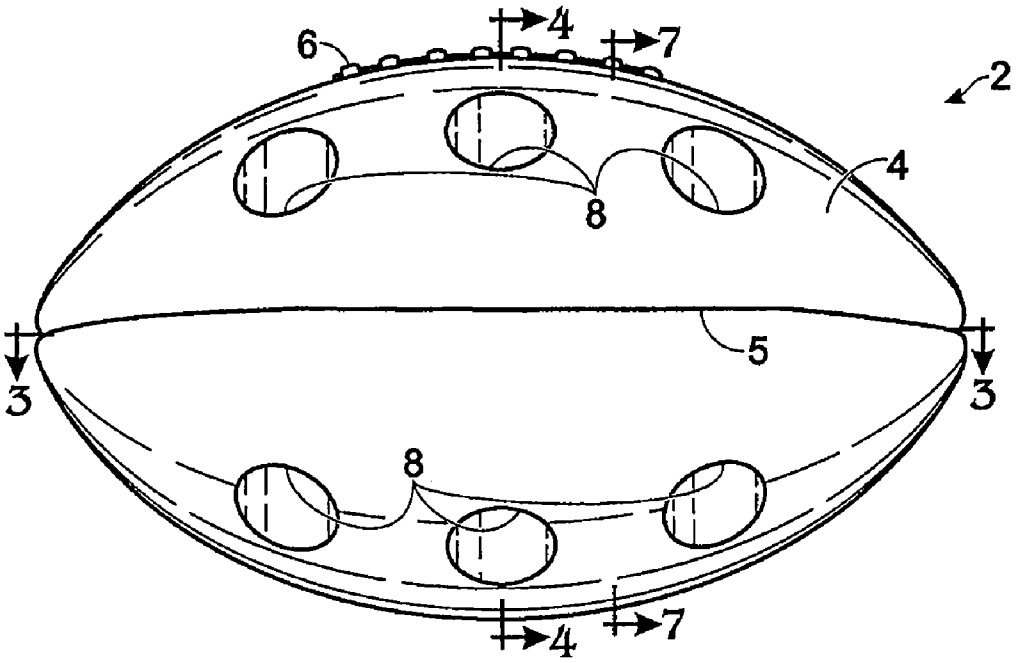


Fig. 1

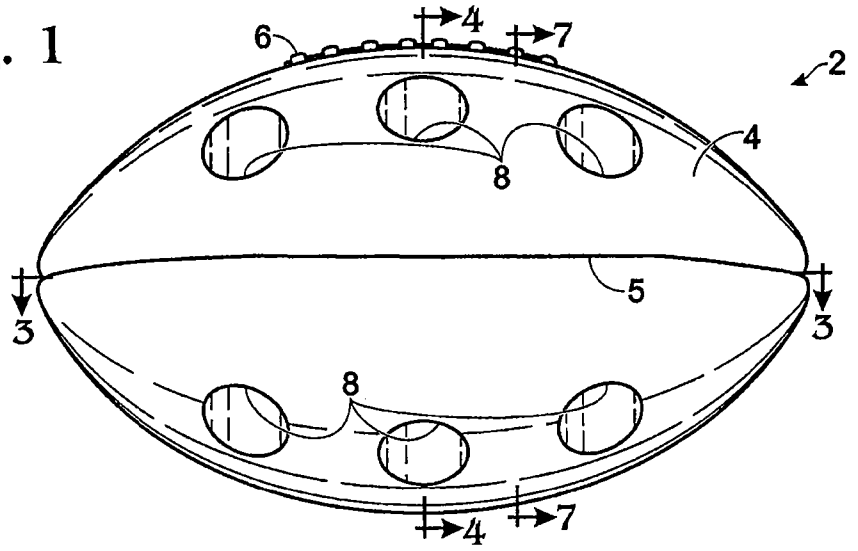


Fig. 2

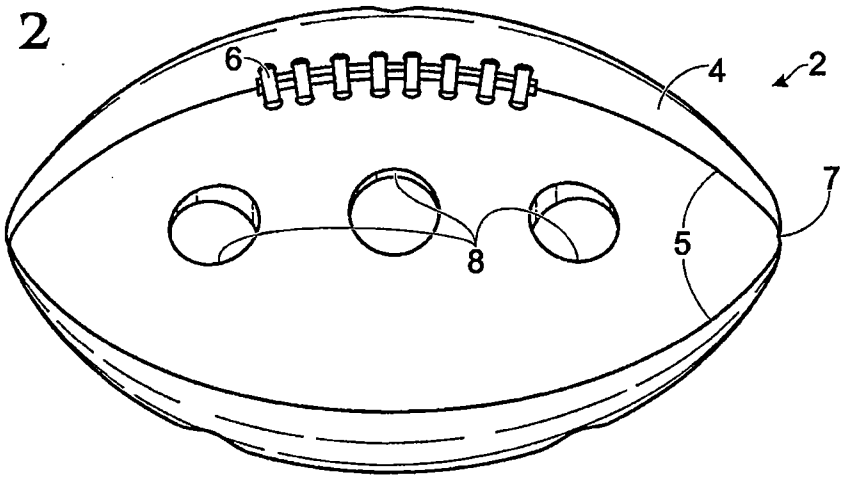


Fig. 3

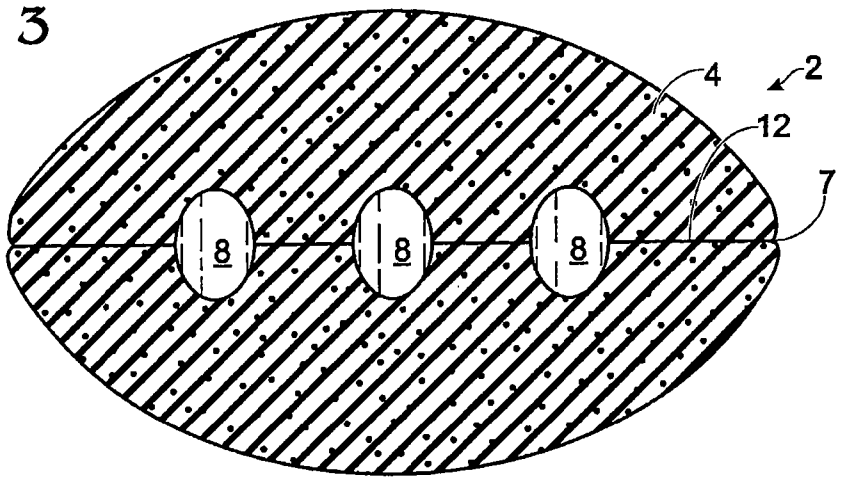


Fig. 4

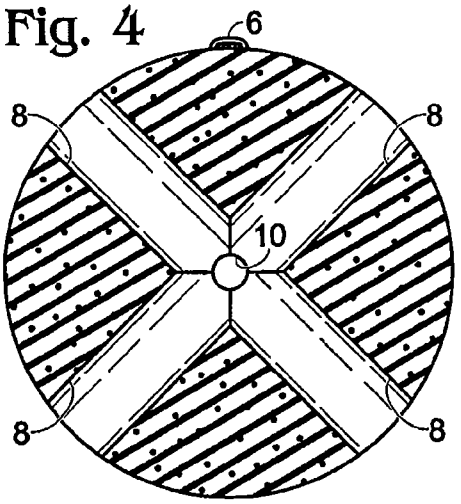


Fig. 5

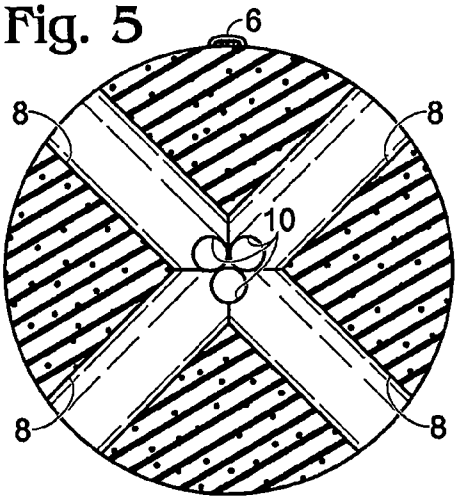


Fig. 6

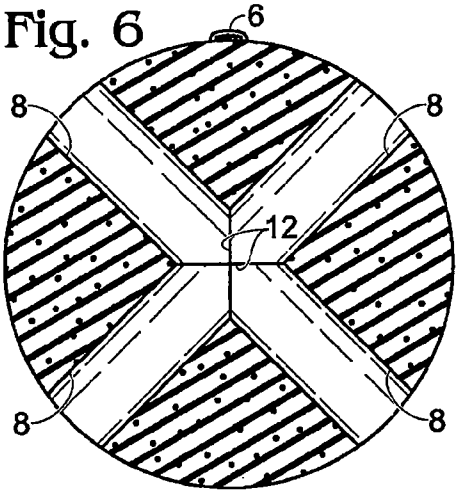


Fig. 7

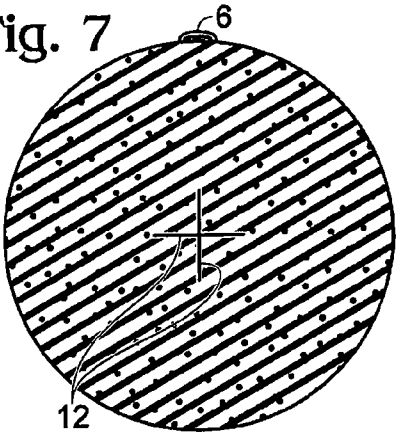
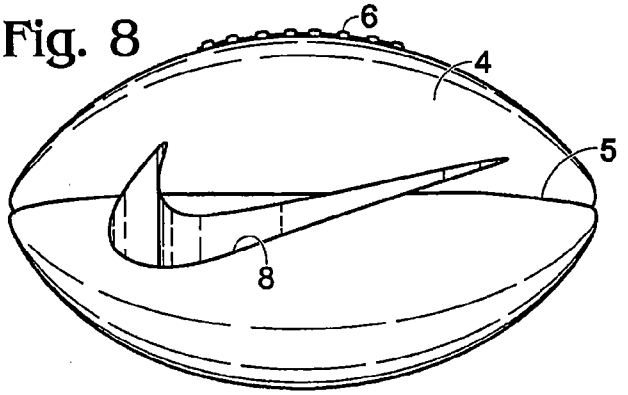


Fig. 8



LIGHTED PROJECTILE

RELATED APPLICATIONS

[0001] The present patent application is a continuation of U.S. patent application Ser. No. 12/573,050, filed on Oct. 2, 2009, which is a continuation-in-part of U.S. patent application Ser. No. 12/011,803, filed on Jan. 29, 2008. Both U.S. patent application Ser. No. 12/573,050 and U.S. application Ser. No. 12/011,803, are hereby incorporated by reference in their entireties.

TECHNICAL FIELD

[0002] The present invention relates to a projectile that is adapted for use in low light situations. It is designed to be safe and to minimize damage potential, while presenting an aesthetically appealing throwing projectile. In particular, the present invention relates to a soft, durable, spongy football that presents as an alluring toy to market to sports enthusiasts of all ages, perfect for evening tailgating events.

BACKGROUND

[0003] In the past, previous attempts to illuminate sports balls have relied heavily on battery powered devices. Such devices require numerous components including, for example, batteries, light emitting elements such as light bulbs, and housing units for these components. These additional components are cumbersome and their added weight increases the chance for injury or property damage, should the projectile not be caught by the intended recipient.

[0004] Lighted sports balls have been made by applying an exterior coating of phosphorescent paint or material that cause the balls to "glow-in-the-dark" after initially being "charged" by exposure to light. This approach allows the sports ball to remain light weight, but it does not provide a very intense light.

[0005] Improved sports balls have been developed that use chemiluminescent light sources, or "light sticks." One such device is shown in U.S. Pat. No. 5,683,316 (hereafter, "Campbell"), in which a hollow tubular flexible housing is provided to receive the chemiluminescent light stick. The ball described by Campbell still suffers from problems caused by ancillary components, for example, mass is added, decreasing the safety factor and potentially altering the aerodynamics of the ball. Furthermore, Campbell discloses both externally-mounted flexible tubular light sources that are recessed in grooves around the perimeter of the ball, as well as internal tubes for accommodating light sources within the ball. Because light from the internal sources is only visible to the extent that the material of which the ball is made is transparent or translucent, the attractiveness of such a lighted projectile is limited. U.S. Pat. No. 6,726,580 (hereafter, "Peterson") discloses an illuminated football that secures an internal light source using plastic tubing and threaded screw caps. However, these additional elements are not soft and can lead to injury, and, like Campbell's ball, the light intensity from internal sources is compromised by transmission through the ball material.

SUMMARY

[0006] A significant feature of the present invention is omission of additional parts other than a spongy, foam-like projectile and a chemiluminescent light source. In place of a housing, a simple longitudinal perforation may made along a central axis of the projectile to accommodate one or more light sources. Furthermore, orifices are bored through the spongy, foam-like material to allow the light to escape from the body unobstructed, and which allow the projectile to be extremely light weight. Because the orifices are preferably unobstructed, light emitted by the chemiluminescent light source reaches a viewer's eye with the highest optical efficiency, for maximum visual effect. The orifices provide a simulated stroboscopic, or temporal aliasing effect as light is cast out from the orifices as the ball bounces, spins, or moves. Henceforth, a lighted, spongy sports projectile, capable of producing a stroboscopic effect without need of ancillary components, may fulfill a niche in the sporting goods industry.

[0007] The general purpose of the present invention, which will be described subsequently in greater detail, is to provide a novel lighted sports projectile.

[0008] It is an object of the present invention to provide a lighted sports projectile with maximum light transmission.

[0009] It is another object of this invention to provide a lighted sports projectile with enhanced safety features.

[0010] It is a further object of this invention to provide a lighted sports projectile that is easy to throw and catch.

[0011] It is still a further object of this invention to provide a lighted sports projectile capable of producing a stroboscopic effect.

[0012] It is still a further object of this invention to provide a lighted sports projectile capable of producing varying degrees of light intensity.

[0013] It is yet a further object of this invention to provide a lighted sports projectile that is water resistant.

[0014] The subject matter of the present invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. However, both the organization and method of operation, together with further advantages and objects thereof, may best be understood by reference to the following description taken in connection with accompanying drawings wherein like reference characters refer to like elements. Other objects, features and aspects of the present invention are discussed in greater detail below.

[0015] In this respect, before explaining at least one embodiment of the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and to the arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced and carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of descriptions and should not be regarded as limiting.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] FIG. **1** is a side perspective view of the lighted sports projectile.

[0017] FIG. **2** is a side perspective view of the lighted sports projectile rotated approximately 45 degrees.

[0018] FIG. **3** is a longitudinal cross-sectional view.

[0019] FIG. **4** is an axial cross-sectional view taken at the midpoint of the lighted sports projectile having one chemiluminescent light source inserted along its central axis.

[0020] FIG. **5** is an axial cross-sectional view taken at the midpoint of the lighted sports projectile with multiple chemiluminescent light sticks inserted.

[0021] FIG. **6** is an axial cross-sectional view taken at the midpoint of the lighted sports projectile in the absence of a light source.

[0022] FIG. **7** is an axial cross-sectional view taken at the ⅓ and ⅔ positions along the central axis of the projectile.

[0023] FIG. **8** is a side perspective view of an alternative embodiment of the projectile illustrating an orifice cut in the shape of a sports logo.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0024] A lighted projectile, in accordance with the present disclosure, is illustrated in FIGS. **1** and **2**. Its novel design provides the following features that enhance safety when utilizing this invention in the dark: limited mass due to the presence of large orifices; limited velocity due to reduced mass and friction introduced by the large orifices; adjustable mass and velocity for experienced players by the addition of a plurality of light sources; compressibility; adjustable brightness by the addition of a plurality of light sources for differing conditions; a stroboscopic effect enhanced by large orifices; maximum light transmission; enhanced gripability provided by large orifices; and a solid, uniform structure.

[0025] According to a preferred embodiment shown in FIGS. **1** and **2**, a lighted sports projectile **2** preferably has a solid body **4** which is shaped like a standard american football. Body **4** of projectile **2** preferably is made from a soft, spongy polymer material. One such material is commonly sold under the trademark NERF®. NERF® is a solid, spongy cellular material produced by the reaction of polyester with a diisocyanate. Carbon dioxide (CO_2) is liberated by the reaction of a carboxyl group with the isocyanate. Polyester resin reacts with a compound while CO_2 is simultaneously released by another reaction. It is this CO_2 gas that creates open pockets within the polyurethane that results in a soft and light material. Use of the NERF® material reduces the mass of the football and consequently the potential for injury should someone or something be struck by the ball.

[0026] Body **4** of the NERF®projectile has a surface **5** that is divided into quadrants **6** by four longitudinal grooves **7** (resembling seams) spaced 90° apart on the surface **5**. Body **4** preferably includes simulated laces **8** formed from the NERF® material in the style of a regulation american football. Additionally, according to a preferred embodiment, twelve round orifices **9** are carved or molded into body **4** the orifices **9** arranged in six opposing pairs, and extending radially inward from surface **5**, normal to a central axis **10** of the body **4** (six of the twelve orifices **9** are shown in FIG. **1**, and three orifices **9** are shown in FIG. **2**). Orifices **9** are preferably arranged in a repeating pattern on the surface **5** of projectile **2**. For example, twelve orifices **9** may be arranged in groups of three, each group centered within a separate quadrant **6** so that four groups of three orifices **9** are equally spaced about the exterior of the football. In a preferred embodiment, orifice pairs intersect such that their midpoints align along the central axis **10** extending between the ends of the football. In this configuration, orifices **9** located at the same distance from the end of the football converge at a point along the central axis **10**.

[0027] Removal of material to create the orifices **9** limits the mass of body **4**, which in turn limits the speed at which the projectile **2** can be thrown. Reduced mass and slower velocity help to further reduce the risk of injury or damage should the football not be caught by the intended recipient. Additionally, the orifices **9**, serve as finger holes that facilitate gripping body **4**, making the football easier to throw and catch, which further decrease the risk of injury. The combination of spin imparted by throwing the football, and light emitted from the six pairs of orifices **9** creates a stroboscopic effect, increasing visibility and hence safety of the football. Large orifices **9** act to increase the wind drag along the surface and thus increase the spiraling effect when the ball is thrown. This in turn speeds up the stroboscopic effect, thereby enhancing visibility.

[0028] Referring now to FIG. **3**, the body **4** includes a perforation **12** along the center axis extending internally along the entire length of body **4**, through both ends of the football. The perforation **12**, which may be in the form of a bore, or simply an "X slit," allows a light source **11** to be inserted, or slidably engaged, into the body **4** through either end. The compressibility of the NERF® material allows a plurality of light sources **11** to be inserted via perforation **12** into the same body **4** to increase brightness (See FIGS. **4** and **5**). FIG. **4** shows an axial cross-section of a preferred embodiment at the center of the body **4**, with one light source **11** inserted; FIG. **5** shows an axial cross-section at the center of the football with three light sources **11** inserted; and FIG. **6** shows an axial cross-section of a preferred embodiment at the center of the football without a light source. This X slit design allows the body **4** to remain as a uniform, solid foam unit as the X slit **12** extends from end to end of the football and can be made by passing a long razor cutter through the football. In general, perforation **12** serves as a "sloppy fit" bore shown in FIGS. **6** and **7** at the ⅓, middle and ⅔ positions of the football. This "sloppy fit" easily accommodates variations in length and diameter of light sources **11** produced by different manufacturers. This allows simplification in fabrication, and interchangeability of replacement parts. Essentially, the present invention may be made from an existing foam sports throwing object with a minimum of tooling, procedures and cost. Since it is the friction of the light stick with the perforated foam that retains the light source **11** in place, as more sources are added, the foam is compressed more and the friction increases. This is important as it secures the light sources to a greater extent as the football gains mass and can be thrown faster and farther. This serves as another self-regulating safety feature. Although, in this embodiment, there need not be a cavity in which to retain the light source(s), in an alternative embodiment, a cavity may be formed to accommodate the light source by removing material to produce a narrow, cylindrical axial bore having a radius equal to or slightly smaller than that of light source **11**, so that light source **11** fits snugly into the axial bore and remains there, held securely. In an alternative embodiment, a housing may be provided for holding the light source, though the housing is not needed.

[0029] According to a preferred embodiment, light source **11** is preferably a chemiluminescent, commercial "light stick," including a glass vial holding a hydrogen peroxide solution encased in a plastic tube holding a phenyl oxalate ester and a dye. When the plastic tube is bent the fragile glass vial is broken and the two solutions mix. The chemicals immediately react with one another, and the atoms begin emitting light. The particular dye used in the chemical solution gives the light a distinctive color. Alternatively, light source **11** may be a battery-operated light source such as a light-emitting diode (LED), or a battery-powered chemiluminescent light stick in which the chemical reaction is initiated via a switch.

[0030] Orifices **9** allow the highest degree of light transmission from the chemiluminescent light source **11**. Because there are no additional barriers between the light source **11** and the human eye, there is no additional refraction or absorption of the light emitted from the source. The emitted light propagates unobstructed from the light source **11** to the eye. Once light source **11** has been activated and inserted into the body **4**, through perforation **12**, the football can be thrown at night, and its visibility is enhanced in dimly lit environments during daytime use. The football's visibility is linked to the velocity and distance with which the football can be thrown. As the number of light sources **11** utilized simultaneously increases, so does the football's overall mass and the distance the object can be thrown. Thus the safety feature may be thought of as self-regulating.

[0031] FIG. **8** illustrates an alternative embodiment in which the orifices **9** may be crafted in accordance with an artistic design or an organizational logo. For example, orifices of different shapes may be cut into the body of the projectile, shapes that resemble the logos of sports teams, sporting goods manufacturers, corporations, businesses, non-profit agencies and the like, for marketing purposes. Orifices **9** may be elongated, formed into alphanumeric characters, sculpted, painted, dyed, or otherwise shaped or colorized to customize the body **4** for artistic or commercial advantage. Even without illumination, the shapes of the orifices themselves lend a unique appearance and grippability to the projectile **2**.

[0032] In a preferred embodiment, the overall end to end length of the projectile is approximately within the range of 10-12 inches, the maximum diameter is approximately within the range of 5-6 inches and the orifice diameter is within the range of 1-2 inches. These dimensions are dictated primarily by the size of commercially available light sources **11**.

[0033] The above description will enable any person skilled in the art to make and use the lighted projectile described herein. It also sets forth the best modes for carrying out this invention. There are numerous variations and modifications thereof that will also remain readily apparent to others skilled in the art, now that the general principles of the present invention have been disclosed.

[0034] As such, those skilled in the art will appreciate that the conception, upon which this disclosure is based, may readily be utilized as a basis for the designing of other structures, methods and systems for carrying out the several purposes of the present invention. For example, other sports throwing projectiles may be similarly configured such as softballs, basketballs, baseballs, volleyballs, golf balls, rugby balls, and the like. It is important, therefore, that the claims be regarded as including such equivalent constructions insofar as they do not depart from the spirit and scope of the present invention.

1. An illuminated projectile comprising:
a solid body having a surface;
a cavity formed by removing a portion of the solid body;
a light source disposed within the cavity; and
one or more orifices extending from the surface to the light source, the orifices allowing unobstructed propagation of light, thus creating a stroboscopic light display when the projectile is set in motion.

2. The illuminated projectile of claim **1** further comprising an at least partially transparent housing for retaining the light source within the cavity.

3. The illuminated projectile of claim **1** wherein the light source is a battery-operated light-emitting diode.

4. The illuminated projectile of claim **1** wherein the orifices are crafted in the shape of an organizational logo.

5. The illuminated projectile of claim **4** wherein the organizational logo is a team logo.

6. The illuminated projectile of claim **4** wherein the organizational logo is a corporate logo.

7. The illuminated projectile of claim **1** wherein the orifices are carved from the solid body.

8. The illuminated projectile of claim **1** wherein the orifices are molded during fabrication of the solid body.

9. An illuminated projectile comprising:
a solid body having a surface;
an at least partially transparent housing for disposed within the solid body;
a light source disposed within the housing; and
one or more orifices extending from the surface to the light source, the orifices allowing unobstructed propagation of light, thus creating a stroboscopic light display when the projectile is set in motion.

10. The illuminated projectile of claim **9** further comprising a cavity, formed by removing a portion of the solid body, to accommodate the housing.

11. The illuminated projectile of claim **9** wherein the light source is a battery-operated light-emitting diode.

12. The illuminated projectile of claim **9** wherein the orifices are crafted in the shape of an organizational logo.

13. The illuminated projectile of claim **12** wherein the organizational logo is a team logo.

14. The illuminated projectile of claim **12** wherein the organizational logo is a corporate logo.

15. The illuminated projectile of claim **12** wherein the orifices are carved from the solid body.

16. The illuminated projectile of claim **12** wherein the orifices are molded during fabrication of the solid body.

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