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(54) **FLYING CYLINDER**

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(57) **ABSTRACT**

A flying cylinder has a leading portion and a tail portion, wherein the leading portion is pointed to a degree such that the curf thickness is equal or less than 2 mm. In preferred flying toys, the tail portion has an average thickness of at least the thickness of the leading portion.

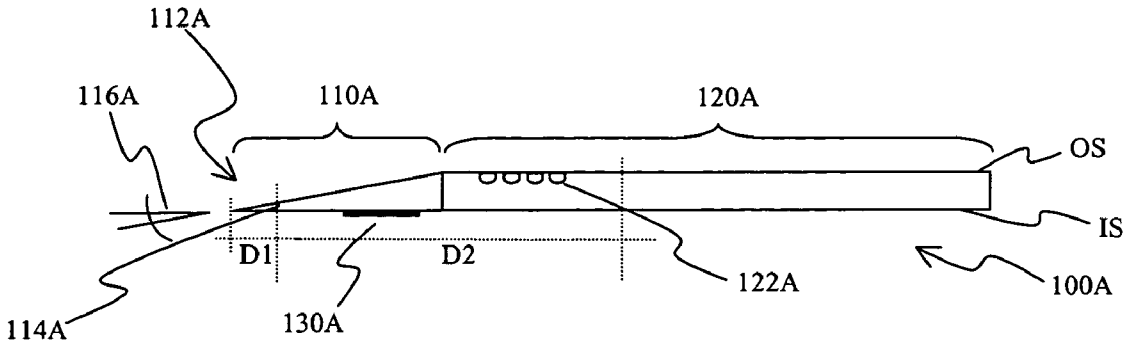


Figure 1A

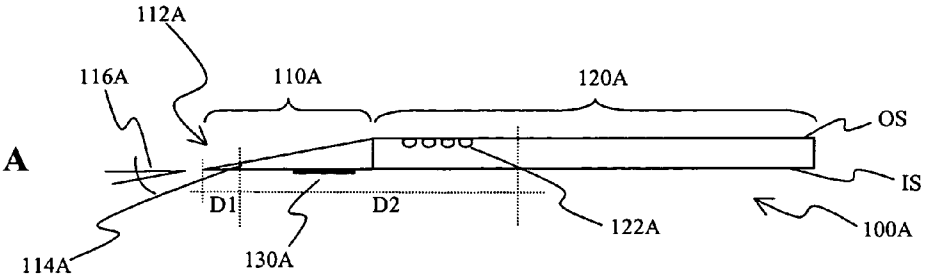


Figure 1B

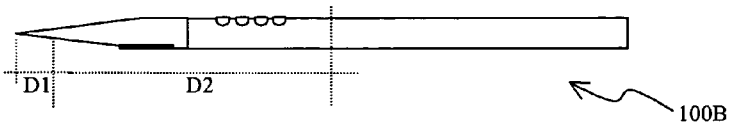


Figure 1C

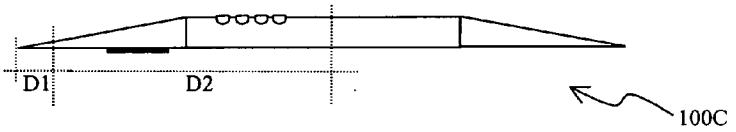


Figure 1D

Figure 1E

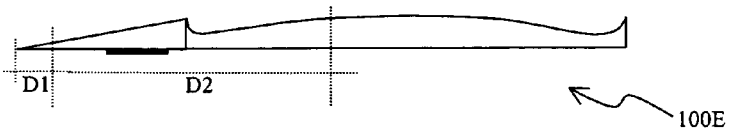
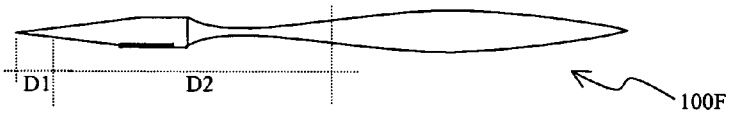


Figure 1F



FLYING CYLINDER

[0001] This application claims the benefit of our provisional patent application with the Ser. No. 60/568,653, which was filed May 5, 2004, and which is incorporated by reference herein.

FIELD OF THE INVENTION

[0002] The field of the invention is flying toys, and especially flying cylinders.

BACKGROUND OF THE INVENTION

[0003] Flying cylinders have recently enjoyed considerable popularity, and numerous of such toys are known in the art. Depending on the configuration and desired flight characteristics, various elements in the cylindrical toy are of at least perceived importance.

[0004] For example, Hill teaches in U.S. Pat. No. 4,790,788 that specific proportions between the body length and diameter, and body diameter and forward edge thickness are important for desirable flight qualities. Similarly, as described in U.S. Pat. No. 6,048,245 by Forti et al., a predetermined ratio of perimeter to thickness of the forward edge and/or greatest thickness of the body imparts highly desirable flying quality to the toy. In still further known flying cylinders, the weight distribution between the forward edge and the tail are described as critical to a gyroscopic flying device as taught by Forti et al. in U.S. Pat. No. 5,816,880. Alternatively, a weight may be movably coupled to the leading portion to allow a user to modify the flight quality as described in U.S. Pat. No. 4,246,721 to Bowers.

[0005] Additional elements are reported to help improve flight patterns, and representative examples are described in U.S. Pat. No. 4,151,674 to Klahn et al, in which a boundary layer tripping mechanism produces a turbulent layer that improves flying characteristics. Etheridge describes use of an airfoil profile in which the airfoil is formed by a blunt front end as taught in U.S. Pat. No. 4,850,923 or U.S. Pat. No. 5,152,709 to Johnson III, et al. in which the flying toy doubles as beverage insulator. Similarly, McMahon teaches in U.S. Pat. No. 5,067,922 a flying beverage insulator that has a blunt and weighted forward edge. To improve rotational momentum, a flying ring may be equipped with a structure to which a tether is releasably coupled to increase spinning of the toy once the flying toy is launched as described in U.S. Pat. No. 4,329,807. Further known cylindrical flyers may also have a flexible of foldable tail portion as reported in U.S. Pat. No. 5,810,637 to Mileti and U.S. Pat. No. 6,679,748 to Forti et al.

[0006] In a different use, as less-than-lethal weapons, flying cylinders have been as projectiles that are fired from a gun to immobilize or otherwise deter a person that is hit by the flying cylinder. Exemplary flying cylinders that are used as less-than-lethal weapons are described by Flatau et al in U.S. Pat. Nos. 3,898,932, 3,951,070, and 4,190,476. While such flying cylinders typically exhibit predictable flight paths, the rotational momentum needed for stable flight is substantial (typically at about 2000 rpm).

[0007] Therefore, while there are numerous flying cylinders known in the art, all or almost all of the suffer from one or more disadvantages. Among other things, where known cylindrical flyers have relative thick walls, flying characteristics are often less than desirable. Thus, there is still a need to provide improved flying cylinders.

SUMMARY OF THE INVENTION

[0008] The present invention is directed to improved cylindrical flying toys that are fabricated from a relatively thick material. Superior flying characteristics are imparted by a pointed front forward edge.

[0009] In one aspect of the inventive subject matter, contemplated cylindrical flying toys will therefore comprise a cylindrical leading portion having a forward edge with a curf thickness of less than 2 millimeter and a cylindrical tail portion with an average thickness of at least 2 millimeter in an area that is between 4 centimeter and 6 centimeter from the forward edge, wherein the leading portion and the tail portion have a weight distribution such that the forward edge of the flying toy faces forward during flight.

[0010] The leading portion in particularly preferred toys has maximum thickness that is equal to the average thickness of the tail portion, and has a length of less than 2 cm when measured from the forward edge. It is further preferred that the outside and inside surfaces of the leading portion form an angle of less than 35 degrees to thereby form at least part of the forward edge, wherein the inside surface of the leading portion is preferably straight and parallel to the inside surface of the tail portion. In further contemplated flying toys, the leading portion has an outer diameter that is equal or less than the outer diameter of the tail portion. While not limiting to the inventive subject matter, a weight element may be coupled to the leading portion.

[0011] In another aspect of the inventive subject matter, contemplated cylindrical flying toys will have a cylindrical tail portion and a cylindrical leading portion, wherein the toy has a perimeter to curf ratio of between 100 and 200, and a perimeter to thickness of the tail portion of equal to or less than 100. Most preferably, the cylindrical tail portion has an average thickness T_T, wherein the cylindrical leading portion has an average thickness T_F, and wherein $T_F \leqq T_T$, and the leading portion has a length of less than 2 cm when measured from a forward edge. With respect to other aspects of such toys, the same considerations as provided above apply.

[0012] Various objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWING

[0013] **FIGS. 1A-1F** are schematic detail illustrations of a longitudinal cross section of various flying toys.

DETAILED DESCRIPTION

[0014] The inventors have discovered that cylindrical flying toys, and especially hand-propelled flying toys can be manufactured from a relatively thick material while retaining superior flying characteristics when such toys include a pointed forward edge. In particularly contemplated toys, the curf thickness and to some degree the thickness of the tail portion, is dependent on the perimeter of the cylinder.

[0015] Therefore, the inventors generally contemplate a flying toy comprising a preferably cylindrical leading por-

tion with a forward edge having a curf thickness of less than 2 millimeter and a cylindrical tail portion having an average thickness of at least 2 millimeter in an area that is between 4 centimeter and 6 centimeter from the forward edge. The leading portion and the tail portion in such toys have a weight distribution such that the forward edge of the flying toy faces forward during flight.

[0016] As used herein, the term "curf thickness" refers to the thickness of the forward edge as measured in a position that is 1 millimeter away (in direction of the tail end) from the forward edge. As also used herein, the term "forward edge" refers to the segment of the leading portion that cuts into the air during flight. For example, the forward edge is in many cases the portion of the flying toy that contacts the ground when the toy is placed on the ground with the leading portion first. As still further used herein, the term "leading portion" refers to the angled portion of the flying toy that points forward during flight (i.e., that includes the forward edge). Therefore, in many cases, the leading portion ends at the position at which the outer surface of the leading portion is (or turns) parallel to the longitudinal axis of the cylindrical toy. In other cases, and especially where the leading portion is stepped as depicted in **FIG. 1D**, the leading portion ends at the last step. The leading portion has therefore in many embodiments a length of between about 5 millimeters and 5 centimeters, more typically between about 1 centimeter and 3 centimeters, and most typically between about 1.5 centimeters and 2.5 centimeters (as measured from the forward edge towards the tail end).

[0017] As still further used herein, the term "hand-propelled" toy refers to a toy that is launched by a user without help of a device that provides at least some kinetic energy to the toy (e.g., using a spring operated launcher, a sling-shot-type launcher, etc.). Viewed from another perspective, the user of a hand-propelled toy will typically grip the toy with one or both hands and then propel the toy into the air in a throwing motion. Consequently, in some of contemplated embodiments, an instruction may be provided to the flying toy that depicts and/or describes use of the toy in a manner in which the toy is manually propelled (i.e., without a launcher or other device that provides kinetic energy to the toy) by the user into the air In one exemplary contemplated aspect of the inventive subject matter as depicted in the cross sectional view of **FIG. 1A** (not to scale), a flying toy **100**A includes a cylindrical leading portion **110**A and a cylindrical tail portion **120**A, wherein the outer surface of the cylindrical toy is denoted OS while the inner surface is denoted IS. The leading portion **10**A has a forward edge **112**A with a curf thickness **114**A of 2 millimeter as measured at distance D**1** (here: 3 millimeter) from the front of the leading portion. The inner surface of the leading portion (which is typically straight and parallel to the inner surface of the tail portion **120**A) and the outer surface of the leading portion form an angle **116**A of about 30 degrees. Metallized plastic strip **130**A is affixed to the inner surface IS of the leading portion **110**A to provide a weight distribution that allows the flying toy to fly with the forward edge pointing forward when the toy is manually propelled in the air (preferably with a spinning motion around the cylindrical axis). The tail portion **120**A has a thickness of about 3 millimeter as measured at distance D**2** (here: 50 millimeter) from the front of the leading portion. Preferably, a plurality of dimple-shaped indentations **122**A is included in the outer surface OS of the tail portion **120**A. Alternatively, contemplated flying toys need not be limited to the shapes depicted in **FIG. 1A**, and exemplary suitable shapes are depicted in **FIGS. 1B-1F** (in cross sectional view). It should be recognized that while the exemplary Figures depict the forward edge as a sharp (pointed) edge, alternative edge configurations are also deemed suitable and included semicircular or otherwise rounded or irregular shapes.

[0018] It is typically preferred that the flying toy has a generally cylindrical shape with a circular horizontal cross section, however, ellipsoid or otherwise irregularly shaped horizontal cross sectional profiles are also contemplated suitable herein. With respect to the outer diameter of the flying toys, it is generally preferred that the maximum outer diameter (of the leading portion and/or tail portion) is such that the toy can be propelled by a user's hand. Consequently, the perimeter of contemplated toys will generally be in the range of about 10-60 centimeters, more preferably in the range of between about 20 and 40 centimeters, and most preferably between about 30 to 35 centimeters. However, smaller perimeters are also contemplated, particularly where the toy is launched via a blowpipe. Similarly, and especially where mechanical launchers are employed, larger perimeters are also deemed suitable.

[0019] In further generally preferred aspects, the maximum length of contemplated flying toys will typically be in the range of about 5 centimeters and 30 centimeters, more typically between about 7 and 25 centimeters, and most typically between about 10 and 20 centimeters. It should be noted that where the term "about" is employed in conjunction with a numeral, the value of that numeral may vary +/−10%, inclusive.

[0020] Depending on the particular shape (see e.g., **FIGS. 1A** to **1**F) of the leading portion, it should be recognized that the thickness (or weighted average thickness where appropriate) of the leading portion may vary considerably. However, it is generally preferred that the leading portion is pointed in the direction of the flight, and that the curf thickness is equal or less than 2 millimeters. Thus, further preferred leading portions will have a maximum thickness that is equal to the average thickness of the tail portion. Where the thickness of the leading portion changes and where the thickness of the tail portion changes, it is generally preferred that $T_F \leqq T_T$ wherein T_T is the average thickness of the tail portion and wherein T_F is the average thickness of the leading portion. However, in various alternative aspects of the inventive subject matter, the thickness of the leading portion may (preferably only in part) exceed the maximum thickness of the tail portion. Therefore, in most preferred aspects, it should be recognized that the leading portion has a maximum (or weighted average) outer diameter that is equal or less than a maximum (or weighted average) outer diameter of the tail portion. In further contemplated aspects of the inventive subject matter, preferred flying cylinders will have a diameter to curf thickness ratio that is typically in that range of between about 30 to 70 (and more preferably 40 to 60) for diameters greater than 9 cm of the leading and/or tail portion. For example, where the diameter of the tail portion is 9.12 cm (3¾"), it is generally preferred that the curf thickness is about 2 mm. For tail diameters of less than 9 cm, it is typically preferred that the curf thickness is 2 mm or less (regardless of a diameter to curf ratio).

[0021] It is further preferred that the leading portion has a length of less than 2 cm as measured from the forward edge, and that the leading portion includes an angle of equal to or less than 35 degrees. It should be recognized that the angle may be formed in numerous manners (see e.g., **FIGS. 1A-1F**), and all known manners of angle formation are deemed suitable for use herein. However, it is generally preferred that the angle is formed by at least one of the outside and inside surfaces of the leading portion, and that such an angle is less than 35 degrees. Among other suitable angles, it is contemplated that the inside surface of the leading portion is straight and parallel to an inside surface of the tail portion, while the outside surface will form an angle with the inside surface of about 15-25 degrees.

[0022] It is still further contemplated that a weight element may be coupled (permanently or temporarily) to the leading portion of the toy, wherein the weight element may be positioned on the inside surface, partially within the material of the leading portion, or on the outside. However, it is generally preferred that the weight element is disposed on the inside surface of the leading portion. With respect to the weight, it is generally preferred that the weight element will have a mass between about 0.5 gram and 50 gram, and more typically between about 2 gram and 10 gram. However, the particular weight is at least in part determined by the weight of the leading portion and/or tail portion. Preferably, the weight element is configured and positioned such that the weight distribution between the leading portion and the tail portion allows flight of the toy with the forward edge facing the direction of flight. Consequently, in many embodiments the weight distribution is such that the axial center of gravity lies about 5-35% (as calculated from the total length of the toy) away from the forward edge. Alternatively, it should also be recognized that the weight element may be entirely omitted where a desired weight distribution is achieved by a particular choice of materials (e.g., high density polyethylene in the leading portion and Styrofoam in the tail portion).

[0023] Similarly, depending on the particular shape (see e.g., **FIGS. 1A** to **1F**) of the tail portion, it should be recognized that the thickness (or weighted average thickness where appropriate) may vary considerably. However, it is generally preferred that the thickness of the tail portion is equal or greater than the thickness (or weighted average thickness where appropriate) of the leading portion. In most preferred embodiments, the thickness of the tail portion will be equal or greater than 2 millimeters, and more preferably equal or greater than 3 millimeters. Especially preferred curf thickness is typically equal or less than 3 millimeters, and more typically equal or less than 2 millimeters. Thus, viewed from another perspective, contemplated flying toys will have a cylindrical tail portion and a cylindrical leading portion, wherein the perimeter to curf ratio is between 100 and 200 (more preferably between 130 and 170), and the perimeter to thickness of the tail portion of equal to or less than 100.

[0024] Suitable materials for contemplated cylindrical flying toys may vary considerably, and it should be appreciated that all known materials for flying toys are considered appropriate for use herein. However, it is especially preferred that the cylindrical flying toy is manufactured from a light-weight material (e.g., having a density of less than the density of water). Consequently, particularly preferred materials include foamed polymers, cardboard, and combinations thereof (which may also include reinforcing structures from other materials (e.g., metals, hard plastics, etc.). It is still further contemplated that the cylindrical toys may include additional elements, and particularly contemplated elements may be added to the cylinder (e.g., streamers, wings, etc.), or subtracted from the cylinder (e.g., one or more channels, and especially spiral-shaped channels, indentations such as golf ball-type dimples, etc.).

[0025] Viewed from yet another perspective, the inventors contemplate a flying cylindrical toy having a cylindrical tail portion with an average thickness of at least 2 millimeters and a curf thickness of equal or less than 2.5 millimeters, wherein a leading portion forms a forward edge such that the toy flies predictably at least 25 meters in a horizontal direction when manually thrown. The term "flies predictably" as used herein means that the actual path of flight of the flying toy and the intended path of flight (e.g., straight ahead relative to a user's perspective) will deviate no more than 30 degree in at least 8 out of 10 attempts.

[0026] Thus, specific embodiments and applications of improved flying cylinders have been disclosed. It should be apparent, however, to those skilled in the art that many more modifications besides those already described are possible without departing from the inventive concepts herein. The inventive subject matter, therefore, is not to be restricted except in the spirit of the appended claims. Moreover, in interpreting both the specification and the claims, all terms should be interpreted in the broadest possible manner consistent with the context. In particular, the terms "comprises" and "comprising" should be interpreted as referring to elements, components, or steps in a non-exclusive manner, indicating that the referenced elements, components, or steps may be present, or utilized, or combined with other elements, components, or steps that are not expressly referenced.

What is claimed is:

1. A hand-propelled flying toy, comprising:

a cylindrical leading portion having a forward edge with a curf thickness of equal or less than 2.5 millimeter;

a cylindrical tail portion having an average thickness of equal to or at least 2 millimeter in an area that is between 4 centimeter and 6 centimeter from the forward edge; and

wherein the leading portion and the tail portion have a weight distribution such that the forward edge of the flying toy faces forward during flight.

2. The flying toy of claim 1 wherein the leading portion has maximum thickness that is equal to the average thickness of the tail portion.

3. The flying toy of claim 2 wherein the leading portion has a length of less than 2 cm when measured from the forward edge.

4. The flying toy of claim 2 wherein outside and inside surfaces of the leading portion form an angle of less than 35 degrees.

5. The flying toy of claim 1 wherein the inside surface of the leading portion is straight and parallel to an inside surface of the tail portion.

6. The flying toy of claim 1 wherein the leading portion has an outer diameter that is equal or less than an outer diameter of the tail portion.

7. The flying toy of claim 1 wherein a weight element is coupled to the leading portion.

8. The flying toy of claim 1 wherein at least one of the leading portion and the tail portion comprises a dimpled surface.

9. A hand-propelled flying cylindrical toy having a cylindrical tail portion and a cylindrical leading portion, wherein the toy has a perimeter to curf ratio of between 100 and 200, and a perimeter to thickness of the tail portion of equal to or less than 100.

10. The flying toy of claim 9 wherein the cylindrical tail portion has an average thickness T_T, wherein the cylindrical leading portion has an average thickness T_F, and wherein $T_F \leqq T_T$.

11. The flying toy of claim 9 wherein the leading portion has a length of less than 2 cm when measured from a forward edge.

12. The flying toy of claim 9 wherein the inside surface of the leading portion is straight and parallel to an inside surface of the tail portion.

13. The flying toy of claim 9 further comprising a weight element coupled to the leading portion.

14. The flying toy of claim 9 wherein outside and inside surfaces of the leading portion form an angle of less than 35 degrees.

15. The flying toy of claim 9 wherein the perimeter to curf ratio is between 130 and 170.

16. The flying toy of claim 9 wherein at least one of the leading portion and the tail portion comprises a dimpled surface.

17. The flying toy of claim 9 wherein the leading portion forms a forward edge such that the toy flies predictably at least 25 meters in a horizontal direction when manually thrown.

18. The flying toy of claim 9 wherein at least one of the perimeter to curf ratio is between 100 to 120 and a diameter of the cylindrical tail portion is less than 7 inches.

19. A hand-propelled flying cylindrical toy having a cylindrical tail portion with an average thickness of at least 2 millimeters and a curf thickness of equal or less than 2.5 millimeters, wherein a leading portion forms a forward edge such that the toy flies predictably at least 25 meters in a horizontal direction when manually thrown.

20. The flying toy of claim 19 wherein the average thickness is measured in an area that is between 4 centimeter and 6 centimeter from the forward edge.

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