Casing for Soft Projectile and Method for Making Same

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ABSTRACT
A casing for a relatively soft projectile, such as a projectile for a paintball gun, has a concave portion for receiving a substantially round soft projectile, a driving band located behind the concave portion, and an aerodynamic portion located behind the driving band. The driving band preferably has lands and grooves for engaging rifling in the bore of the gun. The aerodynamic portion may have the approximate shape of a prolate spheroid or a paraboloid of revolution, or another shape that reduces eddy currents and drag behind the projectile. The concave portion of the casing preferably has an adhesive to prevent separation of the casing and projectile in flight. The casing may be solid or hollow; in the later case, it may be filled with a substance such as urethane foam.
Casing for Soft Projectile and Method for Making Same

Claim for Priority

This application claims the priority of U.S. Provisional Patent Application Ser. No. 60/959,073, titled “Casing for Pliable Soft-Projectile and Method for Making Same,” filed Jul. 11, 2007, which application is incorporated by reference into the present application.

Incorporation by Reference


Background

This disclosure relates to guns that propel projectiles using compressed gas as a propellant. More particularly, it relates to an improved projectile for use in combination with a gas powered projectile gun firing soft or pliable ammunition such as paint balls or pepper balls. Paint balls have a liquid center covered by a thin plastic or gelatin membrane that maintains the paint ball in an approximately spherical shape. Pepper balls have a powder filled center covered by a thin, relatively harder, plastic shell, but still accurately described as “soft” projectiles.

Drawings

FIG. 1 depicts a casing for a soft projectile.
FIG. 2 depicts another embodiment of a casing for a soft projectile.
FIG. 3 depicts details of the combination of a casing and a soft projectile and other embodiments. The casing is also shown in cross-section.

Description

In large-caliber, high-velocity guns there is some risk of the shock of impact with the rifling “stripping” the driving band of the shell. To combat this, some weapons have progressive rifling, in which the rifling grooves start out parallel then gradually increase in twist down the barrel. In barrels for soft-projectile guns, the relationship between the mass and size of the projectile and the propellant force is similar to that in conventional high-velocity cannon. We have found that because of this relationship, the driving-band feature may be adapted to low-velocity soft-projectile guns.

A gun for firing the projectile casing (110) disclosed here preferably has progressive rifling (120) to cause the rotation of the liquid or powder center of the ball (100) to match the rotation of the outer membrane as the ball leaves the gun barrel. This results in enhanced ball stabilization against tumbling and drift in flight, leading to longer flights and improved accuracy. In other embodiments using the same methods for making, however, the rifling of the bore could be non-progressive, or the lands and grooves on the driving band (115) of the casing (110) could be eliminated, so that a smooth casing (110) engages rifling in the barrel.

A further advantage of the casing (110) is that it can improve the aerodynamics of the projectile over those of a conventional spherical ball (100), resulting in reduced drag due to eddy currents. This allows for longer flights of the ball (100), with improved accuracy.

FIG. 1A shows a casing (110) of the preferred embodiment. The casing (110) has a concave portion (130) for receiving the substantially round projectile (100). The driving band portion (115) of the casing (110) has rifling (120), comprising grooves and lands integral with the driving band portion (115). FIG. 1B shows a rifled casing (110) with a projectile (100) inserted into it. In FIGS. 1A and 1B, the casing has an aerodynamic portion (160). The aerodynamic portion (160), as shown in the figures, preferably has the shape of a section of a prolate spheroid or a paraboloid of revolution; as commonly stated, an “egg-shape.”

FIG. 2 shows another embodiment of the casing (110). Here, the casing (110) has no aerodynamic portion on its rear, only a flat surface (135) immediately behind the driving band (115). FIG. 2A shows an adhesive (150), such as cyanoacrylate glue, in the casing (110), to adhere to the projectile (100), so that the projectile (100) is not released from the casing (110) when it exits the bore of the gun. The adhesive (150) could of course also be applied in the other embodiments illustrated in FIGS. 1 and 3.

FIG. 3 shows different embodiments of the casing (110). FIG. 3A shows a cross-section of the casing (110) without an aerodynamic appendage (160), as in FIG. 2. In FIG. 3, the casing (110) is shown as hollow, and the inside of the casing (110) is preferably filled with a substance (140) to increase the solidity of the casing (110) and projectile (100) combination. The substance (140) could be urethane foam or a similar plastic. Alternatively, it is possible for the casing (110) to be manufactured as a solid object. FIGS. 3B and 3C show other embodiments having aerodynamic portions (160). FIG. 3B shows a cone shape, and FIG. 3C shows a truncated cone shape for the aerodynamic portion (160) of the casing (110).

We have found that the combination of projectile (100) and casing (110) disclosed will quickly align with and engage the rifling of a barrel, so as to impart a spin to the projectile (100). This will be so in other embodiments where the casing (110) lacks lands and grooves, although not as efficiently.

The disclosed casing (110) can be constructed by molding from a cast made from a rifled barrel, or from a cast machined for this purpose. Alternatively, the casing could be formed by plastic extrusion. Suitable materials for the casing are most thermoplastics, such as polyurethane, polycarbonates, such as LEXAN, from the GE Plastics Company, acrylics, or ABS varieties. Reinforcing materials could be added to the thermoplastic. Reinforcing materials may include powdered metals such as aluminum or iron, carbon fibers, or fiberglass. An example of such a casting process for rifling is disclosed in the incorporated U.S. patent application Ser. No. 12/164,877.

1. A casing for a soft projectile comprising:
   a concave portion for receiving a substantially round soft projectile;
   a driving band located behind the concave portion; and,
   an aerodynamic portion located behind the driving band.
2. The casing of claim 1, where the driving band has lands and grooves for engaging rifling.
3. The casing of claim 1, where the aerodynamic portion has approximately the shape of a section of a prolate spheroid.
4. The casing of claim 1, where the aerodynamic portion has approximately the shape of a section of a paraboloid of revolution.

5. The casing of claim 1, where the aerodynamic portion has approximately the shape of a cone.

6. The casing of claim 1, where the aerodynamic portion has approximately the shape of a truncated cone.

7. The casing of claim 1, where the casing has a hollow inside.

8. The casing of claim 1, further comprising: a substance filling the inside of the casing.

9. The casing of claim 1, further comprising: an adhesive located in the concave portion, for adhering the soft projectile to the casing.

10. A casing for a soft projectile, comprising: a concave portion for receiving a substantially round soft projectile; a driving band located behind the concave portion; and, the casing having a flat surface immediately behind the driving band.

11. The casing of claim 10, where the driving band has lands and grooves for engaging rifling.

12. The casing of claim 10, where the casing has a hollow inside.

13. The casing of claim 10, further comprising: a substance filling the inside of the casing.

14. The casing of claim 10, further comprising: an adhesive located in the concave portion, for adhering the soft projectile to the casing.

15. A casing for a soft projectile comprising: a concave portion for receiving a substantially round soft projectile; an adhesive located in the concave portion, for adhering the soft projectile to the casing; a driving band located behind the concave portion; the driving band having lands and grooves for engaging rifling; an aerodynamic portion located behind the driving band; the aerodynamic portion having approximately the shape of a section of a prolate spheroid; the casing having a hollow inside; and, a substance filling the inside of the casing.

16. A casing for a soft projectile comprising: a concave portion for receiving a substantially round soft projectile; an adhesive located in the concave portion, for adhering the soft projectile to the casing; a driving band located behind the concave portion; the driving band having lands and grooves for engaging rifling; an aerodynamic portion located behind the driving band; the aerodynamic portion having approximately the shape of a section of a prolate spheroid.