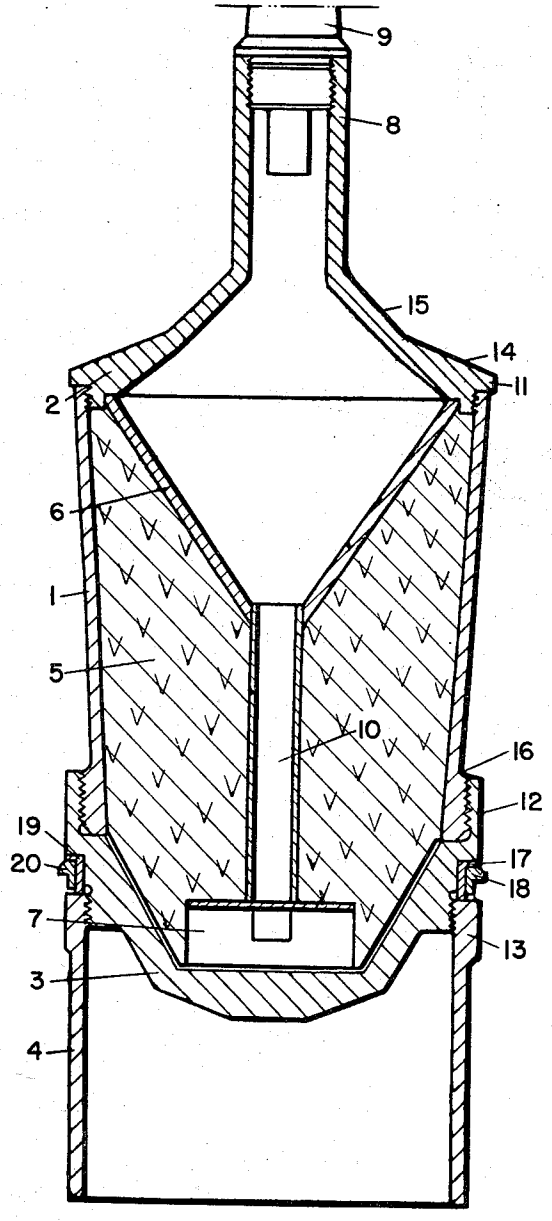
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FINLESS HOLLOW CHARGE PROJECTILE

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FINLESS HOLLOW CHARGE PROJECTILE

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This invention relates to a finless hollow charge projectile having means capable of stabilizing the projectile in its trajectory through the action of the pressure of the turbulent sheath surrounding the projectile, these means being arranged to enable the best possible placing and shape of the hollow charge that corresponds to the calibre of the projectile.

Said stabilizing means are so combined as to enable the projectile to stabilize at subsonic as well as at supersonic velocities.

Further, the invention may be applied to all sorts of projectiles having an effective hollow charge effect, i.e. projectiles that in their trajectories do not gyrate at all or have such a low gyration, about 1000 revolutions per minute or lower, that the jet formed by the hollow charge at the impact will not deteriorate. Thus the invention may be used not only in projectiles having no driving band and being intended to be fired from unrifled launchers, but also to projectiles having a driving band and intended to be fired from guns having a normal rifling, if the driving band is made slipping to such a degree, that the gyration effected by the normal rifling will diminish from its normal value of from about 5000 to about 15,000 rotations per minute to about 1,000 rotations per minute or lower.

The invention will now be described by way of example only with reference to the accompanying drawing, which illustrates diagrammatically a longitudinal section of one embodiment thereof.

The projectile illustrated and forming the subject of the invention comprises a hollow frusto-conical body **1**, having its larger end directed forwardly, a cap **2** screwed into the front end of the frusto-conical body, a base **3** screwed on to the back end of the frusto-conical body and a tail body **4** having the form of an open tube and being screwed onto the base **3**. The frusto-conical body **1** and the base **3** co-operate in forming a chamber to enclose a hollow charge **5**, provided with a metal conical liner **6** at its front cavity end and with a detonator **7** at its base end. The top of the cap **2** is elongated to form a tube **8** at the front end of which is fixed a fuze **9** of the direct impact type. Between the apex of the liner **6** and the detonator **7** is arranged a flame tube **10** for guiding the ignition flame ejected by the fuze **9** at the impact. The cap **2** is provided with a radially projecting flange **11**, the external diameter of which corresponds to the calibre of the projectile so that the flange **11** will serve as a guiding girdle. Also, the external diameter of the front end **12** of the base **3** and the diameter of the front end **13** of the hollow tail body **4** correspond to the calibre and form guiding girdles.

For the purpose of stabilizing the projectile in its trajectory after firing, the projectile is given a certain outer shape and certain dimensions in relation to the weight of the different parts of the projectile, so that the projectile will be stabilized by the action of the turbulent sheath surrounding it in its trajectory.

Generally, the dimensions should be such that the distance from the base of the conical liner **6** to the center of gravity of the whole projectile will be less than ⅓ of the distance from the base of the conical liner **6** to the back end of the hollow tail body **4**. To this effect the hollow tail body **4** should be as light as possible. The cap **2** might be heavier so it will resist the pressure of the air during flight and the center of gravity of the whole projectile will be situated longly forward. Preferably, the center of gravity of the whole projectile should be situated at the apex of the conical liner or in the vicinity thereof. Further, the length of the frusto-conical body **1** should generally be between from ⅓ to ⅔ of the distance from the radial flange of the cap **2** to the back end of the hollow tail body **4**. The length of the hollow tail body **4** and sometimes also the length of the tube **8** should be relatively large, for example about the same as the calibre of the projectile.

The radial flange **11** of the cap **2** should preferably overlap the front end of the frusto-conical body **1**. The external surface of that part **14** of the cap **2** that lies next to the radial flange of the cap **2** should have such a form, extension and direction that during the flight of the projectile in the trajectory the air in front of the projectile will be deflected to the side by said external surface **14**. Consequently, the generatrix of said outer surface **14** should be parallel with or form a small angle with a plane perpendicular to the longitudinal axis of the projectile. Preferably said angle should be less than 30 degrees. Further, said part **14** of the external surface of the cap **2** should be large enough to deflect a substantial amount of the air from in front of the projectile. In the embodiment shown, said external surface **14** of the cap **2** is the conical rotation surface of a frusto-cone and the transition surface **15** to the cylindrical external surface of the tube **8** is also a frusto-conical rotation surface which, however, represents a steeper cone. The length of the generatrix of the external part **14** of the cap **2** next to the flange **11** of the cap **2** is in the embodiment illustrated about ⅓ of the calibre of the projectile.

However, the invention is not limited to a cap **2** having the shape described, for the transition surface of rotation **14** between the radial flange **11** of the cap **2** and the tube **8** may be formed by other sorts of generatrices, for instance a generatrix, having the form of a part of circle, provided that the part of the surface **14** next to the flange **11** meets the required angular relation mentioned above, so that its edge will be sharp.

The frusto-conical body **1** should be slightly tapered. Its generatrix should form an angle with the longitudinal axis of the projectile that varies from about 2 to about 9 degrees depending on the velocity for which the projectile is intended.

The angle between the generatrix of the frusto-conical body **1** and the front end of the base **3** may vary from acute to obtuse and consequently as shown in the embodiment illustrated may be 90 degrees, so that a sharp edge **16** capable of deflecting the air in front thereof will be formed. The wall of the frusto-conical body covers the hollow charge along the major part of its length.

The hollow tail body **4** should, with the exception of its secured front end **11**, have an outer diameter that is a little less than the calibre of the projectile so that the tail when the projectile is fired from gun or launcher will not contact the inner walls of the gun or launcher. Such a contact might possibly cause disturbances in the intended trajectory of the projectile. The outer diameter of the tail body should amount to from about 88–99 percent of the calibre of the projectile but should preferably be about 94–95 percent. Further for the same purpose of not contacting the inner walls of the gun or launcher at firing the wall of the hollow tail body should be made of a non-resilient material, for instance a suitable metal.

Of the stabilizing means the form of the cap and the use of a frusto-conical body and a hollow tail body are the most important.

Around the circumference of the base 3 there is slipping driving means 17, 18, which slips in such a degree that the projectile will get a rotation that is not dangerous to the jet formed by the hollow charge at the impact, for instance a rotation of about 1000 revolutions per minute when the projectile is fired from a gun having a rifling that will give a projectile having a nonslipping driving band a rotational velocity of from about 5000 to about 15,000 revolutions per minute. The slipping driving means comprises an inner slipping bearing boss 17, for instance of steel, having an outwardly projecting radial flange 19 and an outer slipping driving band 18 for instance of copper, which is provided with a flange 20 intended to engage the grooves in the rifling of the gun at firing. However, the slipping driving means 17, 18 does not constitute any essential feature of the invention, since the invention may be applied not only to projectiles intended to be fired from rifled guns or other fire arms but also to projectiles intended to be fired from smooth bored launchers and other weapons.

The steel boss 17 might be provided with a phosphatized layer at its inner and outer bearing surfaces and said phosphatized layer may for the purpose of decreasing the friction be impregnated with oil. The slipping driving band might instead of copper be made of a porous compressible material, for instance sintered iron or a sintered iron alloy, which might be impregnated with an antifrictional agent, for instance oil, paraffine or colloidal graphite.

Having thus described our invention what we claim as new and desire to secure by Letters Patent is:

1. A finless hollow charge projectile comprising, a shell body having a circumferential side wall formed with a rearwardly-tapered outer surface, a bottom wall and a front wall, a charge contained in the body, said charge having a forwardly-directed cavity, a detonator at the rear end of the charge, the charge having a central passage, means for igniting the charge through said central passage, the front wall being provided with a central, forwardly-directed flame tube and having an impact fuze arranged at the end of said tube, stabilizing means on the outer surface of the projectile, said means comprising a sharp-edged border formed by the peripheral edge of the front wall at its meeting with the forward end of the tapering side wall of the body, the front wall having a forwardly-inclined outer surface extending sharply inwardly from said border and deviating from a plane perpendicular to the axis of the projectile at an angle of less than 30 degrees, the outer surface of the side wall of the body slightly tapering rearwardly from its joinder to the front wall, said side wall covering the charge for the major portion of the length of the charge, said bottom wall having a cylindrical surface corresponding to the calibre of the projectile, said surface forming a guiding girdle, a transition surface between the tapered body surface and said cylindrical surface, the direction of said transition surface being essentially perpendicular to the axis of the projectile, and the stabilizing means including a hollow, cylindrical tail body, the outer diameter of which is between 88 to 99 percent of the calibre of the projectile.

2. A projectile of claim 1, in which said shell body comprises a frusto-conical tube forming said side wall, a cup-shaped base forming said bottom wall, the front portion of said base embracing and being fixed to the smaller end of said frusto-conical tube and forming said cylindrical surface and said transition surface, a cap forming said front wall and being fixed to the larger end of said frusto-conical tube.

3. A projectile of claim 2, in which said tail body consists of a tube concentrically fixed to said cup shaped base.

4. A projectile of claim 1, in which the generatrix of said conical surface of the side-wall deviates from the projectile axis at an angle of between 2 and 9 degrees.

5. A projectile of claim 1, in which the peripherical portion of said front wall forms a flange, radially projecting in front of said frusto-conical tube, said flange having an outer diameter corresponding to the calibre of the projectile.

6. A projectile of claim 1, in which a slipping driving band is arranged on said cylindrical surface.

7. A projectile of claim 1, in which the centre of gravity of said projectile is located behind the front end of said hollow charge at a distnace less than ⅓ of the distance from said front end of the hollow charge and the back end of the projectile.

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