

Feb. 27, 1968

L. PERMUTTER

3,370,535

ARMOR PIERCING PROJECTILE

Filed April 14, 1960

3 Sheets-Sheet 1

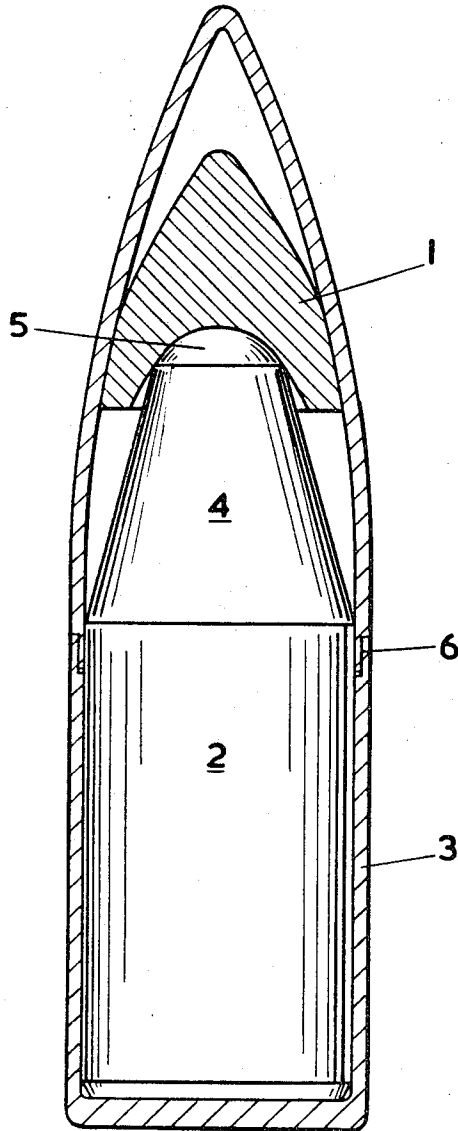


FIG. 1.

Inventor,
By *Ladislav Permutter*
S.J. Rotondi & A.J. Dupont
Attorneys.

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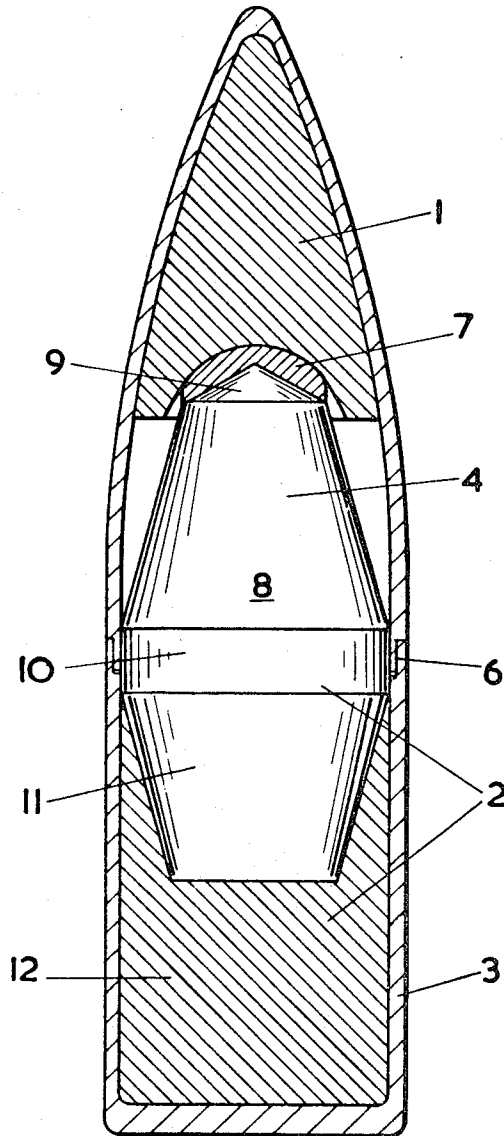


FIG. 2.

Inventor
By *Ladislas Permutter*
S. J. Rotondi & A. J. Dupont
Attorneys.

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L. PERMUTTER

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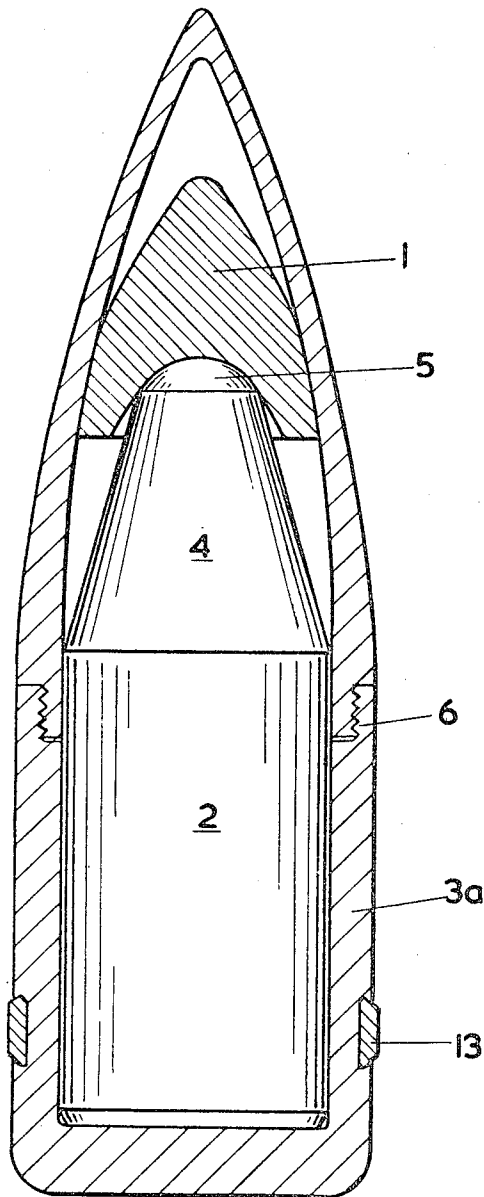


FIG. 3 .

Inventor
By *Ladislas Permutter*
S. J. Rotondi & A. J. Dupont
Attorneys

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ARMOR PIERCING PROJECTILE

Ladislav Permutter, Orpington, Kent, England, assignor to Minister of Aviation, in Her Majesty's Government of the United Kingdom of Great Britain and Northern Ireland, London, England

Filed Apr. 14, 1960, Ser. No. 22,364

Claims priority, application Great Britain, Apr. 14, 1959

12,706/59

1 Claim. (Cl. 102—52)

This invention relates to projectiles and, in particular, to projectiles for attacking armor.

The invention comprises a projectile having a piercing core consisting of at least two parts which include a front portion or nose mounted on the forward end of a rear portion or body, which nose is arranged to turn relative to the body on oblique impact with a target, thereby causing a turning moment to be applied to the body, which turning moment tends to turn the axis of the body towards the normal to the target. The term "body" may also be referred to as "penetrator."

The nose is preferably made of a material having a high density or high compressive strength or both, such as, for example, sintered tungsten, steel or a tungsten alloy; and may be lightly attached to the body or may be retained by a sheath enveloping both body and nose. Preferably, the nose is so mounted as to facilitate turning; for example, it may have a part spherical recess in its rear end which recess co-operates with a part spherical surface on the forward end of the body, or on a subsidiary cup member interposed between body and nose, to form a ball type joint. The use of the subsidiary cup enables the forward end of the body to be of any shape suitable for armor piercing purposes.

The turning of the body enables it to follow a path more nearly normal to the plate and results in a lower energy requirement for perforation since a higher proportion of the plate failure will be due to shear and a lower proportion to plastic deformation. As a result the body may be made wholly or partly from a material of a more ductile nature than those usually employed. Tungsten carbide may, for example, be replaced by sintered tungsten or by a tungsten or uranium alloy. Such bodies can defeat targets at high angles of incidence or multiple targets against which tungsten carbide bodies would fail owing to their brittleness and low tensile strength.

A preferred form of projectile in accordance with the invention comprises an armor piercing body consisting of a forward portion of hard, dense material and a rearward portion of dense, ductile material firmly attached to the forward portion; a nose mounted forward of the body, and arranged to turn relative to the body on oblique impact with target thereby causing a turning moment to be applied to the body, which turning moment tends to turn the axis of the body towards the normal to the target; and a sheath enveloping both body and nose whereby the nose is retained in position during flight of the projectile.

Projectiles of the type herein described are suitable for use either as full bore projectiles or as sub-projectiles to be carried in a casing such as a discarding sabot.

One form of projectile in accordance with the invention will now be more particularly described by way of example only, with reference to the accompanying drawings in which:

FIGS. 1 and 2 are longitudinal sections of subcalibre projectiles for use with a discarding sabot and

FIG. 3 is a longitudinal section of a full bore projectile.

The subcalibre projectile shown in FIG. 1 comprises a nose 1 and a body 2 which together constitute an armor

piercing core and which are enclosed within a sheath 3. The forward end 4 of the body 2 is frusto-conical in form, terminating in a part-spherical tip 5. The external surface of the nose 1 is substantially ogival, the rear part of the surface being suitably modified to mate with part of the internal surface of the sheath 3. The rear end of the nose 1 has therein a recess having a part-spherical portion which mates with the part-spherical tip 5 of the body 2 so that the nose 1 is, in effect, mounted on a ball joint at the forward end of the body 2. The sheath 3 provides the projectile with a suitable ballistic shape and also serves to retain the nose 1 and body 2 in their relative positions. The sheath is made in two parts pressed or screwed together as shown at 6. A suitable combination of materials for this projectile would be a sintered tungsten nose and a tungsten carbide body within a steel sheath.

The subcalibre projectile shown in FIG. 2 comprises, essentially, a composite, armor piercing body 2; a nose 1, forward of the body; a small cup 7 interposed between nose 1 and body 2 and a sheath 3 enveloping the body, cup and nose.

The forward part 8 of the composite body is of tungsten carbide and consists of a forward taper whose contour comprises two coaxial conical portions, the tip 9 having a greater apex angle than the remainder of the taper 4; an intermediate cylindrical portion 10, rearward of the taper 4; and a rear portion 11 of elongated, truncated conical form tapering rearward from the intermediate portion 10. The rearward part 12 of the body is of sintered tungsten and consists of a cylinder having a truncated conical recess in its forward end into which the rear cone 11 of the forward part 8 of the body 2 is fitted and firmly brazed.

A small cup 7 is fitted on to the tip 9 of the body 2 its internal surface being shaped to mate with the conical tip 9 of the body and its outer surface being part spherical to provide a ball seating for the nose 1. The nose 1 is of ogival external contour to fit the internal contour of the sheath 3 and has a recess in its rear end which recess includes a part spherical portion to mate with the outer surface of the cup 7.

The nose 1, cup 7 and body 2 are retained in their relative positions by the enveloping sheath 3 which is in contact with the cylindrical portion of the body 2 and with the outer surface of the nose 1. The sheath 3 also serves to provide a smooth external surface of good ballistic shape.

The small cup 7 and the sheath 3 may be made of any suitable material such as, for example, mild steel. The nose 1 is preferably of a material having either high density, such as sintered tungsten, high compressive strength such as certain steels, or both such as tungsten alloys.

The body 2 may also be made of various alternative materials. In a composite body the forward part 8 could be of hardened steel though the high density of tungsten carbide is an additional advantage. The rearward part 12 of the body 2 is preferably of high density and ductile. The body 2 may alternatively be homogeneous as in the projectile shown in FIG. 1 and consists of either hard or ductile material preferably of high density.

In the full bore projectile shown in FIG. 3, the nose 1 and body 2 are similar to those shown in FIG. 1. The modified sheath 3a has a somewhat thicker wall, rearward of the ogive, than those shown in FIGS. 1 and 2 and is provided with a driving band 13.

On oblique impact with an armor plate the sheath 3 or 3a is stripped from the forward end of the projectile allowing the nose 1 to turn along the plate surface. The turning of the nose 1 causes a turning moment to be applied to the body 2 tending to turn its axis toward the normal to the plate.

For some applications it may be possible to omit the enveloping sheath 3, 3a in which case the nose 1 may be attached to the body 2 by other means such as brazing. The attachment must not however be sufficiently strong to provide a large resistance to turning of the nose 1 relative to the body 2.

I claim:

1. An armor piercing projectile comprising a cylinder having a truncated conical recess in its forward end, a penetrator having a forward taper formed of two coaxial conical portions, an intermediate cylindrical portion and a rearward truncated conical portion tapering rearwardly from said intermediate portion, said rearward portion firmly connected within the conical recess of the cylinder, a hemispherically shaped cup rigidly fitted to the forward end of said penetrator, said cup having mounted thereon an ogival shaped nose portion, said nose portion having a hemispherical recess in its base for snugly receiving said cup within its inner portion only being universally movable with respect to said cup.

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15 BENJAMIN A. BORCHELT, *Primary Examiner.*
 SAMUEL BOYD, SAMUEL FEINBERG, *Examiners.*
 W. J. NELSON, L. W. SANDERS, R. V. LOTTMANN,
 20 R. F. STAHL, *Assistant Examiners.*