

[54] **ARMOR PIERCING BULLET**

[75] Inventor: **Liep Swan Sie**, Brandaris,
Netherlands

[73] Assignee: **Staatsbedrijf Artillerie Inrichtingen**,
Hembrug-Zaandam, Netherlands

[22] Filed: **Oct. 26, 1971**

[21] Appl. No.: **192,001**

[30] **Foreign Application Priority Data**

Oct. 28, 1970 Netherlands..... 7015837

[52] U.S. Cl. **102/52**

[51] Int. Cl. **F42b 11/14, F42b 13/04**

[58] Field of Search..... 102/52, 66, 67

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Primary Examiner—Benjamin A. Borchelt

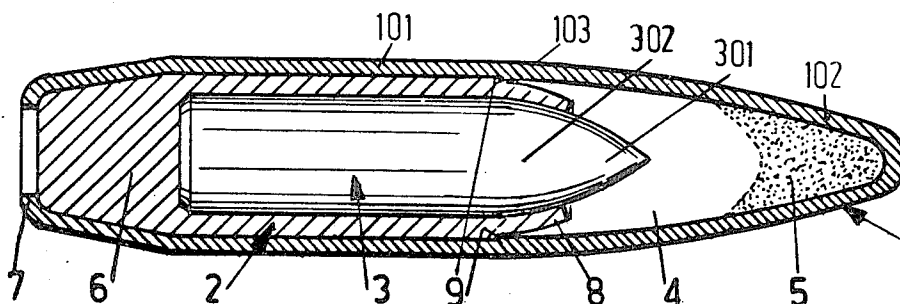
Assistant Examiner—J. V. Doramus

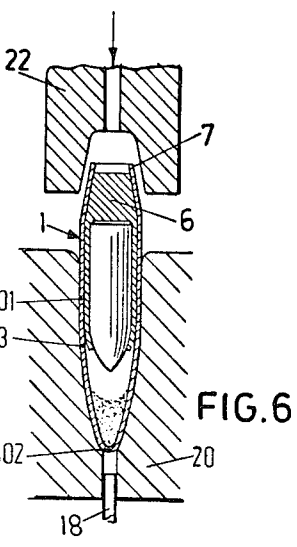
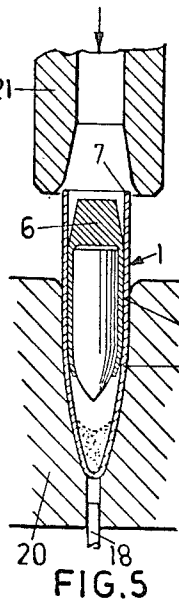
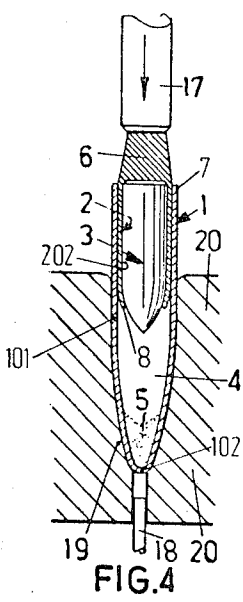
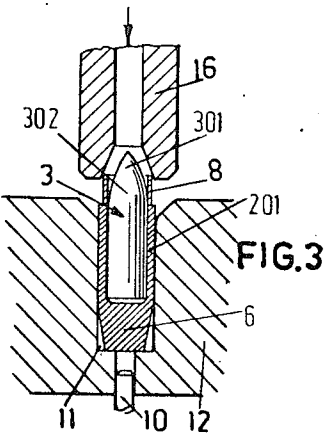
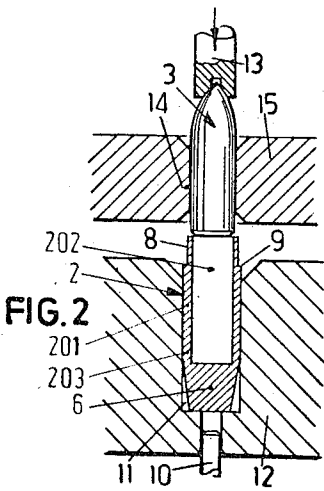
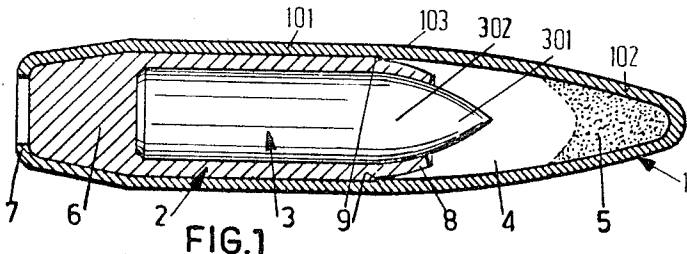
Attorney—John P. Snyder

[57] **ABSTRACT**

An armor piercing bullet is made by first forcing a hard metal core into a sleeve-shaped filler and embedding the core therein. Thereafter the filler and the core are forced, as one unit, into a soft metal bullet jacket. In this way a very good centering of the core within the bullet is obtained, which is necessary for stabilising the bullet in its trajectory. Furthermore, the forces exerted on a quantity of incendiary material which may be located in the jacket's tip are limited in this way so that the risk of spontaneous combustion of this material is decreased.

2 Claims, 6 Drawing Figures





ARMOR PIERCING BULLET

The present invention relates to a method of making an armor piercing bullet having a core of hard material, adapted to pierce armor plate, which is embedded in a filler inside a jacket of substantially soft metal.

Bullets of the kind specified can consist of a jacket of tombac (approximately 90% Cu. and approximately 10% Zn), in which a hard metal core is embedded in a lead filler. In the assembly of a bullet of the kind specified frequently the cavity inside the bullet jacket is first filled with lead, whereafter the core is forced into the lead filler, the core having if necessary at its front a "penetration element" which prevents the core from ricocheting off armor plate if it hits it at an unsuitable angle.

The lead is forced around the core and then fills the space between the core and the jacket. Sometimes the cavity inside the bullet jacket behind the core thus embedded is closed by an extra amount of lead. When a bullet is assembled in this way it is difficult to centre the hard metal core satisfactorily inside the bullet jacket. Moreover, satisfactory centring is important to stabilise the bullet satisfactorily in its trajectory. If the bullet is also to contain in front of the core a quantity of incendiary material which is introduced, for instance, before the lead is introduced into the cavity in the jacket, there is also the risk that the forcing of the core into the lead will exert excessive pressure on the incendiary material, resulting in the spontaneous combustion or explosion thereof.

It is an object of the invention to provide a novel method of assembling bullets of the kind specified by means of which the centering of the core inside the bullet jacket, important for ballistic reasons, is facilitated and which limits the forces exerted by the introduction of the core on any incendiary material disposed at the tip of the bullet jacket.

To that aim the invention provides a novel method of making an armor piercing bullet, which comprises the steps of:

- a. forming a jacket 1 having a cylindrical body portion 101 of substantially uniform internal diameter surmounted by a tapered tip portion 102 joined to and closing one end 103 of said body portion 101, the opposite end 104 of said body portion 101 being open;
- b. forming an armor piercing core 3 having an outer diameter less than said inner diameter of said jacket 1;
- c. forming a filler 2 having at least a sleeve-like portion 201 of substantially uniform wall thickness defining an interior space 202 of substantially the same diameter as said outer diameter of said core 3 and an outer surface 203 of substantially the same diameter as said internal diameter of said jacket 1;
- d. inserting said core 3 within said sleeve-like portion 201 of the filler; and
- e. inserting the core 3 and surrounding filler 2 of step (d) into the open end 104 of said jacket 1 whereby to center said core 3 within said jacket 1.

In a method of this kind the core is first embedded in a substantially bush-shaped filler and then forced together with the bush-shaped filler as a unit into the jacket. The advantage of a method of the kind specified is that the core is embedded in the filler outside the bullet jacket, thus enabling the embedding to be more accurately controlled. The shape and composition of the filler also be such as to afford a ballistically desirable

distribution of the mass of the resultant combination of the bush-shaped filler and the core, and also a simpler and more satisfactorily reproducible manner of introducing this mass into the bullet jacket.

Conveniently according to the invention, on the rear side of the core the bush-shaped filler merges into a solid portion of round cross-section which closes the cavity of the bullet jacket at or adjacent its rear end. The result is that the core and filler can be satisfactorily handled as a whole while rendering superfluous the introduction of a separate element closing the cavity inside the bullet jacket at or adjacent its rear end.

If, as is usually the case, the core is of a conical or substantially conical shape at its front end, according to the invention before the bush-shaped filler is forced together with the core into the bullet jacket, the bush-shaped filler is shrunk around a portion of the cone of the core at the front end of its cylindrical portion. As a result of this step the core is protected against axial displacement in relation to the bush-shaped filler, any such displacement during the firing of the bullet being undesirable for ballistic reasons.

If, as is often the case, the cavity inside the bullet narrows in the forward direction, conveniently according to the invention at its front end the diameter of the bush-shaped filler changes abruptly, and the shoulder formed in the generated surface of the bush-shaped filler by the change in diameter is used as a stop to locate the filler and the core embedded therein in the bullet jacket. This step gives extra protection to the bush-shaped filler and the core in the bullet jacket.

The method according to the invention produces a bullet whose ballistic properties are satisfactorily reproducible. In comparison with a bullet of the same calibre, in which the core bears directly against the inside surface of the bullet jacket and therefore has a larger diameter, the bullet according to the invention has the further advantage of enabling a core of heavier material to be used, maintaining the same overall weight and other ballistic properties, and resulting in a greater depth of penetration.

The invention will be more clearly understood from the following description with reference to the accompanying drawings, wherein:

FIG. 1 is an axial section through a bullet according to the invention and

FIGS. 2 to 6 are diagrammatic axial sections showing a number of successive phases in the production of the bullet as illustrated in FIG. 1.

In its finished state, as illustrated in FIG. 1, the bullet consists of a jacket 1 of tombac (approximately 90% Cu and approximately 10% Zn) containing a substantially bush-shaped filler 2 of aluminium having embedded therein a core 3 of hard metal having a hardness of, for instance, 61 on the Rockwell C scale. At the front portion 102 the cavity 4 in the jacket 1 can be filled with an incendiary material 5. At the rear side the cavity 4 is closed off by a solid portion 6 of the filler 2, where the rear end 7 of the jacket 1 is folded round. Similarly, the front end 8 of the filler 2 is folded around a portion 301 of the conical tip 302 of the core 3. Adjacent the front end 8 the cylindrical sleeve portion 201 of the filler 2 also changes its outside diameter abruptly (clearly visible in FIGS. 2 and 3). The resultant shoulder 9 bears as a stop against the inside of the bullet jacket 1 and locates the filler 2 therein. Similarly, the core 3 is located in the filler 2 by the front end 8

thereof so that the core is protected from displacement in relation to the filler 2 and the jacket 1. Since the filler is of aluminium, a core material of considerable specific weight can be used without exceeding the weight limits customary for a bullet of this calibre, something which would be undesirable for ballistic reasons.

FIGS. 2 to 6 illustrate diagrammatically a number of phases of the making of the bullet, FIGS. 2 and 3 showing the introduction of the core 3 into the filler 2, while FIGS. 4 to 6 illustrate how the filler with the core embedded therein is forced into the jacket 1.

As can be seen from FIG. 2, an aluminum bush 2 produced, for instance, by impact intrusion and acting as a filler is placed in the cavity 11 of a die 12 having at its bottom an ejection pin 10.

The bush or filler has a sleeve-like portion 201 of substantially uniform wall thickness, defining an interior space 202 of substantially the same diameter as the outer diameter of the core 3. The outer surface 203 of the bush 2 has substantially the same diameter as the internal diameter of the jacket 1. Top end 8 of the bush 2 is of smaller diameter than sleeve-like portion 201, however, so that the filler has a circumferential shoulder 9, (see FIG. 2) between top end 8 and sleeve-like portion 201.

A core 3 is then forced by, for instance, a punch 13 into the cavity 202 of the bush 2, the core 3 being guided in a bore 14 in a guide member.

FIG. 3 shows how the top end 8 sleeve-like portion 201 of the bush is folded by a folding punch 16 around a portion 301 of the conical tip 302 of the core 3 so that the core is satisfactorily embedded in the filler 2 (c.f., for instance, also FIG. 4). As a result the core 2 is locked in the longitudinal direction between the top of front end 8 and a solid rear end portion 6 of the filler 2.

FIGS. 4, 5 and 6 show how the core 3 embedded in the filler 2 is forced into the bullet jacket 1.

The bullet jacket is formed as having a cylindrical body portion 101 of substantially uniform internal diameter surmounted by a tapered tip portion 102 joined to and closing one end 103 of the body portion 101, the latter one being open at its opposite end 7.

The jacket 1 is now placed in a cavity 19 of a die 20 having at its bottom an ejection pin 18, whereafter a quantity of incendiary material 5 is introduced into the tip portion 102.

FIG. 4 shows how the filler 2, together with the core 3 embedded therein, is forced by a press punch 17 into the cavity 4 until the shoulder 9 of the filler 2 comes into abutment against the inside of the tapered tip portion 102 of the jacket (see FIG. 5). FIG. 5 shows that

the rear part of the cylindrical body portion 101 of the jacket 1 is then forced by a punch 21 around the solid rear portion 6 of the filler 2. Finally (c.f. FIG. 6) open rear end 7 of the jacket, projecting outside solid rear portion 6 of the filler 2, is folded by a folding tool 22 around the rear portion of the filler. No separate parts have to be used for closing the rear end of the bullet which then has the shape according to FIG. 1.

The operation of the tool parts 10, 12, 13, 15, 16, 17, 18, 20, 21 and 22 does not form part of the invention and is therefore not discussed in any detail.

I claim:

1. An armor piercing bullet comprising an external jacket having a diameter and length conforming to a selected ordnance caliber,

an armor piercing core located within said jacket, and a filler snugly fitted within said jacket and locating said core therewithin, said jacket, filler and core cumulatively providing a predetermined bullet weight which is dictated by said selected ordnance caliber;

said jacket being of shell-like form receiving said filler and said core, said jacket including an elongated body portion of uniform external and internal diameter and a tapered tip portion surmounting said body portion to present an internal cavity surface tapering from said uniform internal diameter of the body portion and closing said jacket at its forward end;

said jacket being of integral one piece construction, said core being of higher specific weight than the jacket and the filler, the jacket and the filler being of soft material relative to said core;

said filler including an elongated shell-like portion snugly received in said elongated body portion of the jacket and presenting a bore coaxial with said jacket and opening into said internal cavity of the jacket; and

said core including an elongated cylindrical body portion snugly received in said bore in coaxial relation within said jacket and a tip portion projecting from said bore, said core being of a specific weight and hardness sufficiently high as both to render it armor piercing and to limit its dimensions in achieving said predetermined bullet weight such that said tip portion of the core projects into said internal cavity of the jacket with clearance whereby said filler constitutes the sole locating and centering means for the core.

2. An armor piercing bullet as defined in claim 1 wherein said filler is provided with a solid rear end portion closing the rear end of said jacket.

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