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[54] **UNDERSIZED-CALIBER PROJECTILE WITH DETACHABLE SABOT**

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[58] **Field of Search** 102/52

[56] **References Cited**

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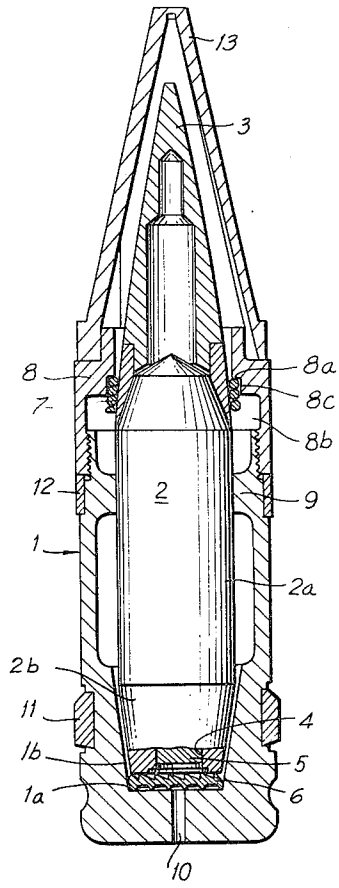
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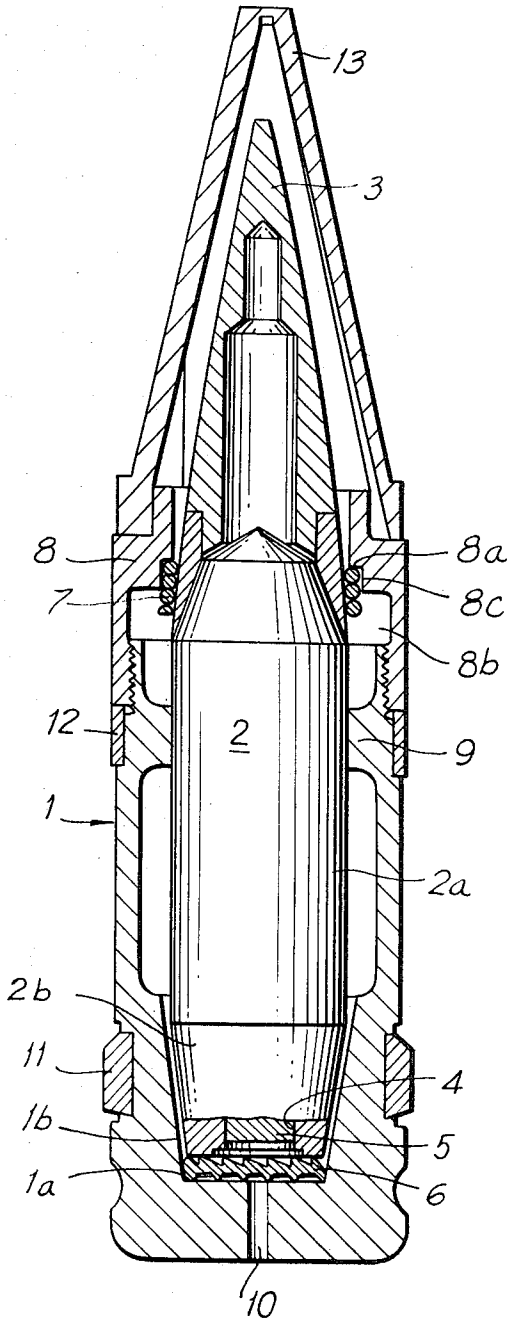
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[57] **ABSTRACT**

An armor-piercing projectile comprising an undersized-caliber core arranged inside a detachable sabot or shoe, wherein a cavity is provided at the back of the core in which a gas generating composition, is seated. The base of the shoe is provided opposite this cavity with a calibrated orifice having a sectional area such as to allow hot gases from a powder charge to pass from the associated casing to ignite the discharge composition, while allowing the developed gas pressure from the composition to be used for effecting discharge.

7 Claims, 1 Drawing Figure




13
3
8
8a
7
8c
8b
12
2
9
1
2a
2b
11
4
1b
5
1a
6
10

UNDERSIZED-CALIBER PROJECTILE WITH DETACHABLE SABOT

FIELD OF INVENTION

This invention relates to projectiles and more particularly to projectiles consisting of separable parts.

BACKGROUND

Various types of armor-piercing projectiles are known which are of a type comprising an undersized-caliber core mounted inside a removable sabot or shoe designed to accompany the core along its path inside a gun tube and impart a gyratory motion thereto. The shoe separates from the core on exit from the gun tube.

This arrangement allows the core to be fired at a substantial velocity due to the larger sectional area of the shoe and appreciably lessens the loss of velocity in flight because of the reduced core caliber. This gives the projectile a better ballistic coefficient.

One difficulty in the above arrangement resides in giving the projectile proper accuracy, this difficulty being closely connected with control of the separation of the shoe and proper entry of the core into rotation.

The shoe is separated by using the differential aerodynamic forces acting on core and shoe. This is, however, hard to control because of the comparatively weak forces brought into play.

SUMMARY OF THE INVENTION

The present invention allows this drawback to be remedied and facilitates satisfactory separation of the shoe as well as proper entry of the core into rotation.

For this purpose, in accordance with the invention, a cavity is machined behind the core and a gas generating composition, called a "discharge compo," is housed therein which is capable of a liberal emission of gases while burning, the base of the shoe being equipped, opposite said cavity, with a calibrated orifice whose sectional area is such as to allow the hot gases from the powder charge to pass from the casing for the purpose of igniting the decant or discharge compo, while allowing the gas pressure generated by the said composition to be used for impelling the discharge. This orifice acting as a nozzle is small enough to maintain a sufficient pressure of a few tens of kilograms per square centimeter inside of the shoe once the projectile has left the tube. A diameter of the order of 1 millimeter is suitable for ammunition operating, for example, under pressures of 3,500 kg/cm^2.

As the discharge composition, an igniting composition can advantageously be of a type capable of producing an abundant liberation of gases while burning, possibly in association with a tracer composition in flight also having an igniting function.

According to another feature of the invention, also for discharge purposes, the core is mounted resiliently inside the shoe between two springs, thus allowing take-up adjustments both on loading and on firing. For this purpose, an elastic part such as a rubber washer is placed on the shoe base, on the one hand, for keeping at the back an elastic union capable of guaranteeing the rotational involvement of the said core while forming an elastic connection between said core and said shoe and, on the other hand, for maintaining in front on the nosepiece by means of a lock spring such as a spiral spring, an elastic ring or an open ring allowing any break in continuity on the piercing core to be avoided.

According to still another characteristic of the invention, the aforesaid lock spring is housed in a cover fixed on the front of the shoe and resting on said spring to press it against the nosepiece of the core and elastically lock the latter in the shoe. Said cover also comprises an annular housing, wherein the said spring can wholly disappear under the action of the centrifugal force due to the rotation of the projectile, thus freeing the core.

According to a further new characteristic of the invention, centering of the core is secured, on the one hand, in front by a guide collar built up on the inside of the shoe or integral with said shoe and adjusted to the body of the said core and, on the other hand, behind by the contact of two conical surfaces provided one behind said core and the other in the base of the said shoe.

Furthermore, the said shoe, which is preferably made of a lightweight material, comprises on the outside, in front, a hard metal guide collar concentric with and located at the same level as the said centering collare and, at the back, a shellband level with the said conical surface and able to work in conjunction with the rifling of the firing tube.

BRIEF DESCRIPTION OF DRAWING

One embodiment of the undersized-caliber projectile with a removable shoe is described hereunder solely by way of illustration and without any limitation of scope with reference to the accompanying drawing in which the sole FIGURE shows a section of said projectile in elevation, the core and washer being in elevation with the former partly broken away at its rear and shown in section.

DETAILED DESCRIPTION

As shown in the drawing, one projectile provided in accordance with the invention essentially comprises a shoe or sabot **1** with an undersized-caliber core **2** mounted inside the same. The core comprises a solid body **2***a* of cylindrical shape with a hind extension **2***b* of frustoconical shape. The core is completed in front with a nosepiece **3**. A cavity **4** is machined behind the core and houses inside it a decant or discharge composition **5** composed of an igniting composition which may be composed as follows:

Ingredients	Percentage by weight
Barium peroxide	50
Strontium peroxide	20
Powdered magnesium	15
Powdered silicon	10
Shellac	5

The igniting composition can be used in combination with a tracer composition if so required.

The core is mounted elastically inside shoe **1** between a multi-cogged washer **6** and a helicoidal spring **7** of one or more coils.

The washer **6** is inserted between the back of the core and the flat base **1***a* of the shoe and is shown in elevation in the drawing, and the washer serves both to guarantee the rotational involvement of the said core and to establish an elastic union between said core and said shoe.

The helicoidal spring **7** is housed in a cover **8** threaded onto the front of the shoe **1**. Said cover comprises an internal shoulder **8a** resting on said spring in order to press it against the nosepiece **3** of the core and

elastically lock the latter inside the shoe. The cover also comprises an annular housing **8***b* in continuation of a tapering duct **8***c* wherein spring **7** can be entirely concealed when this spring expands under the centrifugal force due to the gyration of the projectile, thus freeing the core.

Furthermore, the centering of the core is secured firstly by an internal flange **9** provided in the front of shoe **1** and fitted to the cylindrical body **2***a* of the core, and secondly by a frustoconical recess **1***b* provided at the back of said shoe, contiguous to the base **1***a* and fitted to the frustoconical portion **2***b* of the core. The base of the shoe is further drilled with a calibrated aperture **10** (of 1 mm. bore, for example, for a 20 mm projectile) on the centerline of the projectile and opening into the said recess **1***b* opposite the cavity **4** of the core.

The shoe is also externally equipped with a band **11** at the level of the frustoconical recess **1***b*, and a guide collar **12** at the level of the centering flange **9** and also with a sealed nosepiece **13** fastened onto the cover **8.**

The assembly of such a projectile takes place as follows:

The multi-cogged washer **6** is fitted into the base of the shoe **1** and the lock spring **7** threaded on the nosepiece of core **2.** The core is then inserted into the shoe. Cover **8** is then threaded onto the front of said shoe until it touches guide collar **12.** The core is thereby elastically locked without backlash between washer **6** and spring **7.** Such assembly does not require the use of fittings which would be too exact for economical large-scale production.

The operation of the projectile is as follows:

When firing starts, core **2** recoils by inertia inside shoe **1,** squeezing the multi-cog washer **6.** The frustoconical portions **2***b* of the core and **1***b* of the shoe are brought into contact with each other, thus securing the centering of the core, its alignment with the axis of the gun tube and the entry of said core into rotation. At the same time, the spring is firstly drawn backward by inertia, secondly centrifuged under the rotatory action of the projectile and disappears entirely inside the annular seating **8***b*, thus unlocking the core and bringing about the arming of the projectile.

On issuing from the gun tube, the slight elastic expansion of washer **6** loosens the frustoconical portions **1b** and **2***b*, while the discharge composition **5** ignited by the flame from the powder charge from the casing starts burning and emitting gases whose pressure, when sufficiently built up, causes the core to separate from the shoe.

What is claimed is:

1. An armor-piercing projectile, operable with a powder charge adapted for generating hot gases, comprising an undersized-caliber core, a removable shoe around said core, a cavity being provided in the core, a gas-generating composition in said cavity, the shoe being provided opposite said cavity with a calibrated orifice having a cross-sectional area to allow the hot gases from the powder charge to ignite the said composition, gas pressure developed by the said composition resulting in separating the core and shoe, first and second springs, said shoe including a base, a cover on said shoe, the core being elastically mounted inside the shoe between said springs, said first spring being an elastic part on the base of the shoe and the second spring being a lock spring in said cover and bearing against the core, said lock spring being a helical spring encircling said core, said cover being provided with an annular seating inside which the said helical spring can expand under the effect of the centrifugal force resulting from rotation of the projectile whereby the core is liberated from the shoe.

2. A projectile as claimed in claim **1** comprising a centering collar inside the shoe and fitted to said core, the core and base having respective conical surfaces engaged to position the core.

3. A projectile as in claim **2,** wherein the shoe comprises an external guide collar, concentric with and level with the said centering collar, and a band on a level with the conical surface of the base and adapted to operate in conjunction with the rifling of a firing tube.

4. A projectile as claimed in claim **3** comprising a conical nosepiece on the core.

5. A projectile as claimed in claim **4** comprising a conical nosepiece on said cover.

6. A projectile as claimed in claim **1** wherein said composition includes barium and strontium peroxide and powdered magnesium.

7. An armor-piercing projectile, operable with a powder charge adapted for generating hot gases, comprising an undersized-caliber core, a removable shoe around said core, a cavity being provided in the core, a gas-generating composition in said cavity, the shoe being provided opposite said cavity with a calibrated orifice having a cross-sectional area to allow the hot gases from the powder charge to ignite the said composition, gas pressure developed by the said composition resulting in separating the core and shoe, first and second springs, said shoe including a base, a cover on said shoe, the core being elastically mounted inside the shoe between said springs, said first spring being an elastic part on the base of the shoe and the second spring being a lock spring in said cover and bearing against the core, said core having a rear portion of conical shape, said base of the shoe having a conical recess in which the conically-shaped rear portion of the core is received in spaced relation under the conjoint action of the first and second springs, said conically-shaped rear portion of the core entering into contact with said base at said recess and thus being centered thereby upon rearward travel of the core in said shoe, against the action of the second spring, upon firing of the projectile.

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