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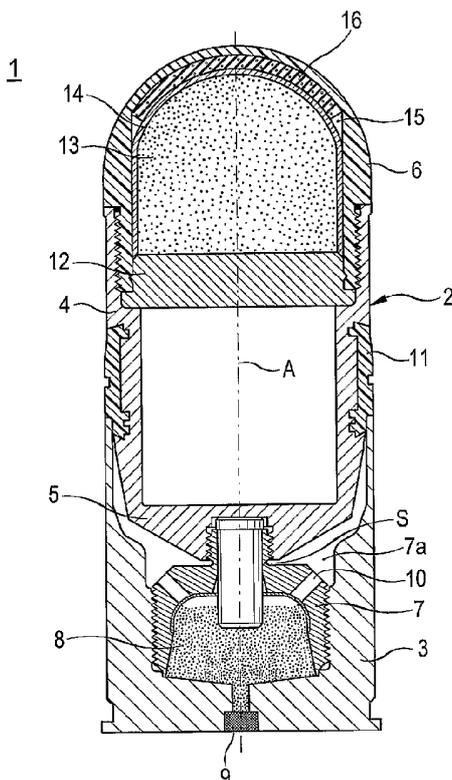
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[Fortsetzung auf der nächsten Seite]

(54) Title: PROJECTILE FEATURING MARKING OF THE POINT OF IMPACT

(54) Bezeichnung: GESCHOSS MIT MARKIERUNG DES AUFTREFFPUNKTES



(57) Abstract: Disclosed is a projectile (2) comprising a projectile body (4) with a projectile bottom (5) and a hollow ogive (6) within which a marking substance (13), e.g. a powdered pigment, is accommodated. In order to prevent the powdered pigment from being released and contaminating a weapon from which the projectile is fired, for example, when the ogive is damaged, the marking substance (13) is covered with a protective cap (14) that bursts when the projectile hits the target.

(57) Zusammenfassung: Das Geschoss (2) weist einen Geschosskörper (4) mit einem Geschossboden (5) und einer hohlen Ogive (6) auf, in der ein Markierungsstoff (13), z. B. ein Farbpulver aufgenommen ist. Um bei Beschädigungen der Ogive zu verhindern, dass das Farbpulver freigesetzt wird und z. B. eine Waffe kontaminiert, aus der das Geschoss abgeschossen wird, wird gemäss der Erfindung vorgeschlagen, den Markierungsstoff (13) mit einer beim Auftreffen des Geschosses auf das Ziel berstenden Schutzhaube (14) abzudecken.

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**Veröffentlicht:**

— mit internationalem Recherchenbericht

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## PROJECTILE THAT MARKS THE STRIKE POINT

### BACKGROUND OF THE INVENTION

The invention relates to a projectile, particularly to a practice round, with a projectile body including a hollow ogive (cup-shaped head) that bursts upon striking the target. This ogive contains dye, particularly a colored powder, whereby the marking material is released to mark the strike point when the projectile strikes the target and when the ogive bursts.

In a practice round, e.g., a practice projectile or a practice bomb that itself does not include live explosive, it is important to mark the strike point on the target so that optimal practice results may be obtained.

For this, the projectile includes at its tip an ogive into which the marking material, e.g., a reddish dye powder, is inserted. The ogive is made of a material such as plastic that bursts when it strikes the target, releasing the dye powder. The dye is scattered for a certain radius around the strike point, and is also scattered by the wind, thus showing the strike point clearly.

Projectiles of the type discussed here are, for example, mid-caliber projectiles (40mm) that are belt-fed and that are fired from a rapid-fire cannon in series.

5 When handling such projectiles, the ogive of a projectile in the belt occasionally breaks open when it strikes an object, at least partially releasing the marking material and contaminating other projectiles. When this occurs the affected projectiles in the belt must be replaced. It is even worse if, for example, the  
10 projectile is improperly aligned in the rapid-fire cannon. In such case, the ogive of the projectile may be broken within the chamber, leading to contamination of the weapon, which must subsequently be cleaned, resulting in lost time. Also, such a misalignment of a live round fired from that weapon may lead to  
15 a loading jam.

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### Object of the Invention

5 It is the object of the present invention to substantially overcome or ameliorate one or more of the disadvantages of the prior art.

### Summary of the Invention

10 The present invention provides a projectile, which is mounted together with a plurality of further projectiles in a belt and is fired from a rapid-fire gun provided with a lock, the projectile comprising:

a projectile body which has a hollow ogive which bursts when the projectile impacts on a target and in which a marking material is accommodated which, when the projectile impacts on the target and after bursting of the ogive, is released in order to mark the point of impact,

wherein the marking material is covered by a protective cap, which is inserted into the ogive and bursts when the projectile impacts on the target, and wherein an intermediate space is left between the ogive and the protective cap in the area of a nose of the projectile.

20 Preferably, a filling material is arranged in the intermediate space and rests on the ogive and on the protective cap.

Preferably, the filling material is a soft foam material.

25 Preferably, the filling material is part in the form of a plate, and is inserted in the intermediate space between the protective cap and the ogive.

If, for example, the ogive is damaged within the firing chamber of a rapid fire cannon because of misalignment, the weapon is not contaminated by escaping marking material, and any splinters

are trapped, and it is even possible that the projectile will be fired successfully.

In the previous text, only a red powder has been mentioned as a marking material. It is advantageous in many cases to include a material visible at night such as a chemoluminescent material located within a container possessing several compartments. When the projectile strikes the target, the container with its compartments containing the chemoluminescent material breaks, mixing the chemoluminescent components so that an illumination effect is produced. Use of such a combination makes the target strike point visible both day and night.

The container with its compartments for chemoluminescent material may, as described in the European Patent Publication No. EP-B1-1 183 494, otherwise be broken by the initial acceleration and/or, with the use of properly designed twist-stabilized projectiles, by centrifugal force, so that the trajectory of the projectile may be tracked optically while in flight. Since in this case the dye powder is inserted between the outside of the ogive and the container receiving the chemoluminescent material, suitable passages must be provided within the projectile so that the light created by the chemoluminescent material may be released. For this, for example, several regions of the projectile body (the so-called

twist-band) may be of transparent material whereby the light created by the chemoluminescent material flows into a hollow cavity in the area of the twist-band. Suitable light conductors of transparent plastic are also possible here, whereby these conductors or other passages may be routed through the dye powder to suitable transparent regions of the projectile body or to the ogive.

#### BRIEF DESCRIPTION OF THE FIGURES

The invention is described in greater detail using illustrations, which show:

Figure 1 a cross-section through a cartridge munition consisting of a cartridge shell and a practice round that contains a marking material within the ogive covered by a protective cap;

Figure 2 a plate of soft foam inserted between the protective cap and the ogive within the projectile per Figure 1; and

Figure 3 a cross-section through a second embodiment of a projectile with a combined marking material by means of which the strike point of the projectile on the target is visible day or night.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Figure 1 shows a cross-section of a practice round 1 that includes a projectile 2 mounted in a cartridge shell. The projectile 2 includes a projectile body 4 with a projectile base 5 facing the cartridge shell 3 and a front ogive 6. Within the cartridge shell 3 a high-pressure propulsion chamber is positioned in which a propulsive charge 8 is provided that combusts upon ignition of an igniter 9. The propulsive gases from the propulsive charge flow via overflow channels 10 into a low-pressure propulsion chamber 7a, where they act on the projectile base. When a certain gas pressure is exceeded within the propulsion chamber, an intentional-break point S between the cartridge shell and the projectile is broken, so that the projectile 2 is propelled out of the cartridge shell 3.

The illustrated practice round is usually fired from a weapon with a drawn barrel with a twist, so an additional twist- or guide-band 11 is provided on the projectile body 4.

Such a practice round consisting of cartridge shell and projectile is described, for example, in U.S. Patent No. 5,936,189.

The ogive 6 rests on an insert 12 within the projectile body that extends perpendicular to the longitudinal axis A of the projectile body 4. The ogive 6 is, for example, a plastic part, cylindrical in its lower region, which transforms into a vaulted hood with the shape of a universal ball joint. In the hollow inner portion of the ogive 6 a marking material, in this case a red dye powder 13, is provided that is placed into a protective cap 14 that covers it. The protective cap 14 that is made, for example, of polyethylene terephthalate (PET), is completely filled with dye, and has a shape roughly corresponding to that of the ogive 6; that is, it has a lower cylindrical part that rests closely on the inner wall of the cylindrical part of the ogive 6 and an adjacent vaulted hood that extends approximately parallel to the hood. A small intermediate space 15 is provided between the protective cap 14 and the ogive 6 that is filled with a filler material 16 that rests on the protective cap 14 and the inner wall of the ogive 15 in the vaulted portion. This material 16 may be, for example, a plate of soft foamed material, as shown in Figure 2. When the projectile is manufactured, this foam plate 16 is inserted into the vaulted part of the ogive 6, and then the protective cap 14 filled with dye material 13 and the insert 12 is inserted into the ogive.

As mentioned above, when the vaulted part of the ogive 6 of the projectile 2 is damaged, e.g., by improper handling of the cartridge or by a misalignment with the firing chamber of the weapon being fired, then the space between the ogive and the protective cap ensures that the protective cap remains intact, thus allowing no dye to escape. The foam basically has the function of protecting the protective cap 14 from damage by any splinters from the damaged ogive.

Figure 3 shows a cross-section through a projectile 2 with a projectile body 4 and an ogive 6 whereby a dye powder is placed into a protective cap 14 within the ogive 6. As in the projectile in Figure 1, there is a space 15 left between the protective cap 14 and the ogive into which a plate 16 of soft plastic is inserted.

A container 21 within which an inner container 22 is mounted rests on the insert 12 that forms the base of the ogive 6. A material is inserted into the inner container 22 and into the space between the inner container and the container 21 that reacts with chemoluminescence upon mixing with the other material. As soon as the projectile strikes a target, the ogive 6 bursts and the dye powder 13 is released. Simultaneously, the containers 21 and 22 are broken so that the two chemoluminescent materials react with each other, releasing an illuminating

signal within the normal visible spectrum, or perhaps within the infrared region that is visible over long distances.

As described in the above-mentioned U.S. Patent No. 5,936,189, the two containers 21 and 22 may be so configured that they burst immediately upon initial acceleration of the projectile and/or by the twisting motion of the projectile immediately after firing, so that the chemoluminescent reaction is initiated. When the light thus created is conducted outward from the projectile body, the trajectory of the projectile may be followed.

There is the option to configure the base of the insert 12 to be transparent at least in a partial region 23 below the two containers 21 and 22 so that the light created by chemoluminescence shines, for example, into a hollow cavity 24 of the projectile body. When one configures the guide- or twist-band 11 to be translucent and the wall of the hollow cavity 24 in a region 25 of the guide-band, then the light may exit from the hollow cavity 24 to the outside, so that the trajectory of the projectile may be followed.

It is possible, of course, to find other passages to the outside for light created by chemoluminescence. For example, the insert 12 itself might be transparent and extend to translucent regions

in the wall of the projectile body so that light is also perceptible from the outside.

Although the above discussion describes advantageous embodiments of the invention, it will be apparent to the specialist that alterations and modifications of the embodiments are possible without deviating from the object of the invention.

**The claims defining the invention are as follows:**

- 5 1. Projectile, which is mounted together with a plurality of further projectiles in a belt and is fired from a rapid-fire gun provided with a lock, the projectile comprising:  
a projectile body which has a hollow ogive which bursts when the projectile impacts on a target and in which a marking material is accommodated which, when the projectile impacts on the target and after bursting of the ogive, is released in order to mark the point of impact,  
10 wherein the marking material is covered by a protective cap, which is inserted into the ogive and bursts when the projectile impacts on the target, and wherein an intermediate space is left between the ogive and the protective cap in the area of a nose of the projectile.
- 15 2. Projectile according to Claim 1, wherein a filling material is arranged in the intermediate space and rests on the ogive and on the protective cap.
3. Projectile according to Claim 2, wherein the filling material is a soft foam material.
- 20 4. Projectile according to Claim 2 or 3, wherein the filling material is part in the form of a plate, and is inserted in the intermediate space between the protective cap and the ogive.
5. Projectile according to Claim 1, wherein a container is accommodated in the marking material and contains components of a chemoluminescent material.
- 25 6. Projectile according to Claim 5, wherein the container for the chemoluminescent material bursts when the projectile impacts on the target, as a result of which the components are mixed and light is produced.
7. Projectile according to Claim 5, wherein the container has two compartments in which the components of the chemoluminescent material are accommodated.
- 30 8. Projectile according to Claim 5, wherein the container for the chemoluminescent material is broken open by the spin and/or the initial acceleration of the projectile, as a result of which the components of the chemoluminescent material are mixed with one another and the chemoluminescence is produced, and wherein light paths are provided within the projectile in order to pass the light which is produced by the chemoluminescence out of the projectile body to the exterior.

9. Projectile according to any one of the preceding claims, wherein the marking material is a dye powder.

5 10. Projectile according to any one of the preceding claims, wherein the projectile is a training projectile.

11. Projectile substantially as hereinbefore described with reference to the accompanying drawings.

**Dated 25 May, 2011**

**Rheinmetall Waffe Munition GmbH**

10 **Patent Attorneys for the Applicant/Nominated Person**

**SPRUSON & FERGUSON**

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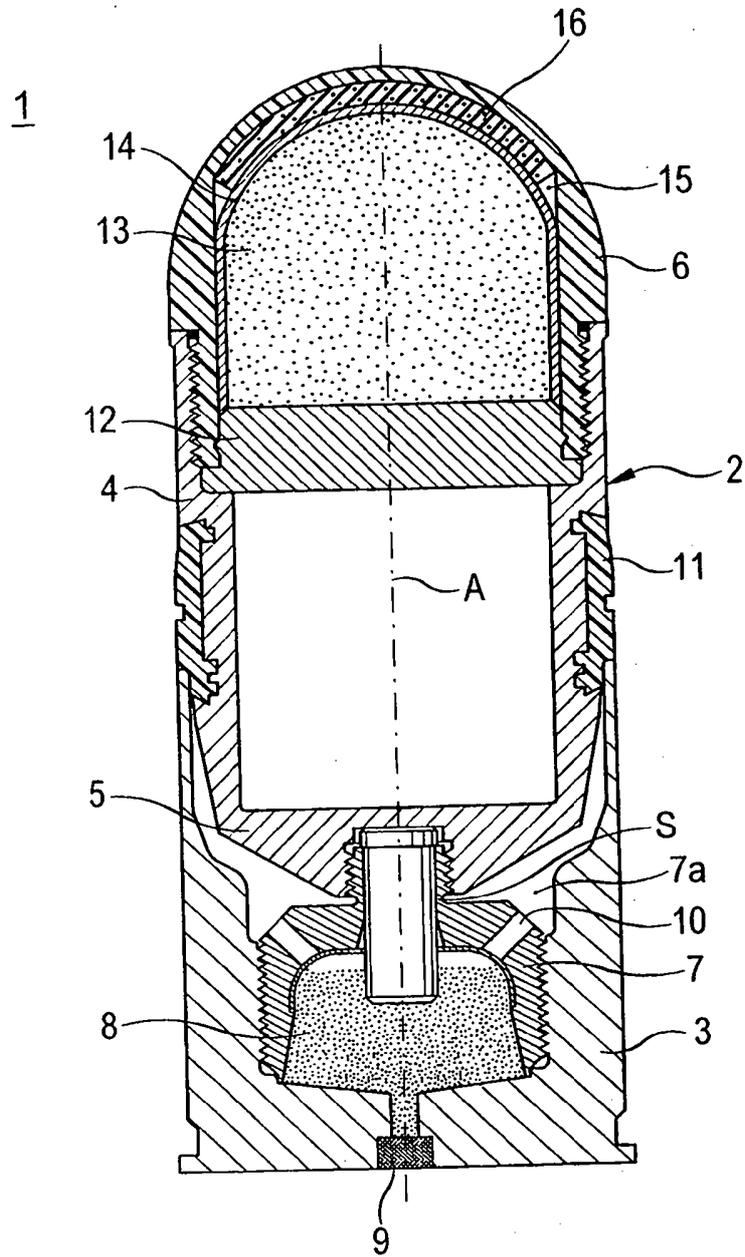


FIG. 1

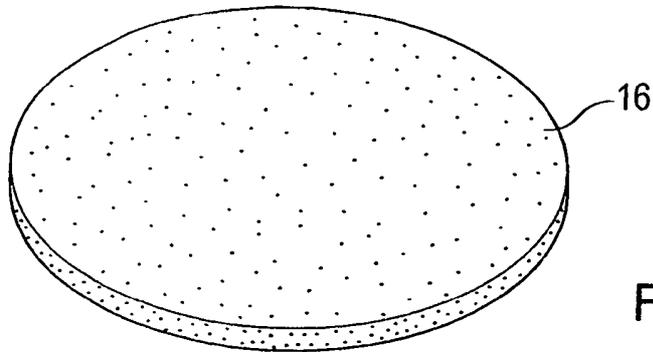


FIG. 2

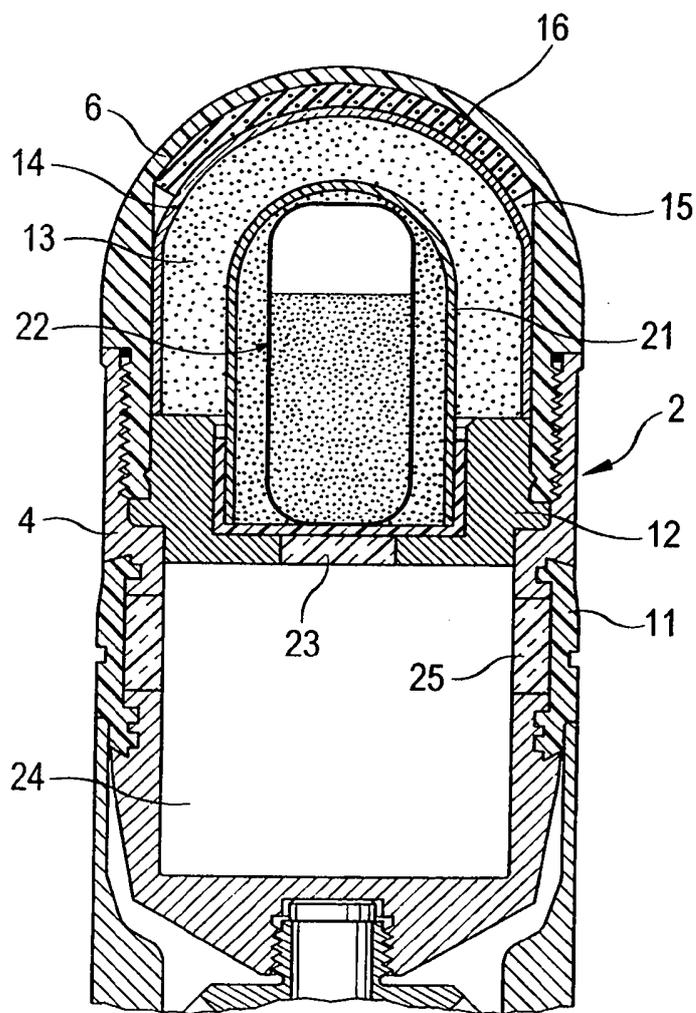


FIG. 3