(12) **Oversettelse av europeisk patentskrift**

(11) **NO/EP 3601938 B1**

(19) NO

NORGE

(51) Int Cl.

F42B 12/06 (2006.01)
F42B 12/34 (2006.01)
F42B 12/36 (2006.01)

Patentstyret

(45)	Oversettelse publisert	2022.12.27
(80)	Dato for Den Europeiske Patentmyndighets publisering av det meddelte patentet	2022.08.17
(86)	Europeisk søknadsnr	18709585.6
(86)	Europeisk innleveringsdag	2018.03.08
(87)	Den europeiske søknadens Publiseringsdato	2020.02.05
(30)	Prioritet	2017.03.27, DE, 102017106526
(84)	Utpekte stater	AL ; AT ; BE ; BG ; CH ; CY ; CZ ; DE ; DK ; EE ; ES ; FI ; FR ; GB ; GR ; HR ; HU ; IE ; IS ; IT ; LI ; LT ; LU ; LV ; MC ; MK ; MT ; NL ; NO ; PL ; PT ; RO ; RS ; SE ; SI ; SK ; SM ; TR
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(54) Benevnelse **PROJECTILE, IN PARTICULAR IN THE MEDIUM CALIBER RANGE**

(56) Anførte publikasjoner

CH-A- 351 522
US-A- 4 444 112
FR-A- 764 833
WO-A1-2004/003460
US-A- 3 782 287
DE-A1- 2 727 970

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DESCRIPTION

Projectile, in particular in the mid-caliber range

The invention deals with a projectile, in particular PELE® ammunition.

The functional principle of PELE ® ammunition, as known from DE 197 00 349 C2, is based on the fact that materials with lower density than the highly effective terminal-ballistic penetration material (referred to below as the penetrator) at high projectile speeds remain in the target compared to the highly effective terminal ballistic penetrator. The enclosed expansion medium breaks the projectile body open under compression on the impact of the projectile and leads to splinter formation.

DE 10 2004 005 042 B4 discloses a universal KE projectile. This differs from known projectiles of this type in that an outer penetrator is mounted around a central penetrator, the outer penetrator contains spherical and/or cylindrical ductile heavy metals and is implemented in an arched shape. The same design can be seen in the central penetrator.

DE 10 2011 011 478 A1 discloses a frangible projectile, especially for practice purposes. This is based on the ammunition known as PELE® ammunition, which is known from DE 197 00 349 C1. For this it will be stated that the construction of such frangible projectiles, especially in the mid-caliber range, places high demands on the production thereof. The segment parts and the core part must be inserted into the outer sleeve area. This must be done precisely in order not to disturb the flight characteristics. In addition, the individual parts must be joined to each other. Said joints are then subject to high demands, for example with regard to launch strength, connectivity to the expansion medium, etc. The basic idea is therefore to make the projectile in one piece. In this case the impact affects the whole projectile. The projectile has recesses for an expansion medium distributed over the cross-section.

Such projectiles are launched from barreled weapons with a spin to stabilize the projectile position on the trajectory. The very high rotation rate imparted by the spin of the projectile also places high demands on the roundness of the projectile body and the penetrator in order to achieve the desired hit accuracy.

DE 27 27 970 A1 discloses a projectile, having a first penetration body and a second penetration body around or in front of the first one and a detonation and/or firing charge and means for igniting those. the projectile consists of a tube-shaped element which houses a penetration element. The penetration element is supported by a circumferential rim. This rim is formed by the projectile body comprising a smaller inner diameter than in the area of the core. The inner diameter in the area of the core is greater than in the front area housing the detonation charge. Additionally the projectile comprises an ogive, which houses an ignition charge.

WO 2004/003460 A1 discloses a projectile or warhead which comprises besides a hard-core or heavy metal core a detonation charge and multiple splinters. the hard core or heavy metal core touch is a circumferential rim. This rim is formed by the projectile body comprising a smaller inner diameter than in the area of the core. The inner diameter decreases as a truncated cone.

CH 35 1522 A discloses a hard-core for a tank projectile, consisting of a rotational body having a tip, wherein the base area of the tip body is smaller than the smallest cross-sectional area of the main body. Thereby a shoulder is formed between the tip and the main body which forms an edge with the casing of the main body.

Here it is the object of the invention to specify a projectile with a high hit accuracy. Another aspect is to reduce the effort required to produce this projectile.

The object is achieved by the features of claim 1 and claim 4.

A projectile body is advantageously formed as a tube section from very brittle, hardened material. In its rear part there is a penetrator. This compresses an expansion medium on hitting a target. This leads to the break-up of the body of the projectile. Due to the brittleness of the material of the projectile body, the desired splinter formation is achieved. The projectile body, together with a projectile stern, guides the penetrator during the passage thereof through the barrel during firing and during the flight to the target.

This roundness cannot be achieved by simply cutting a long barrel into suitable barrel sections, as the barrel sections warp during the hardening process. However, on the one hand warped sections of barrel lead to poor hit accuracy. On the other hand, completion with a very precisely manufactured penetrator can lead to fractures of the body during production. The consequence may be an increased

rejection rate. But also during launch there can be fractures of the projectile, i.e. in the weapon or shortly after leaving the muzzle, which then leads to the premature disintegration of the projectile. The required roundness of the body is therefore usually achieved by reworking, such as fine turning or cylindrical grinding, of the inner and outer diameters. This reworking is carried out outside and inside over the full length of the section of barrel that is produced oversize.

However, the invention is based on the idea of not reworking the projectile body to the required roundness inside and out over its entire length, but on carrying out the reworking of the inner diameter for the accommodation of the penetrator from both sides at a distance from the center of the body of the projectile. This obtains a constriction remaining in the region of the middle of the barrel section.

Said constriction has the advantage that, on the one hand, the penetrator can be set against said constriction during the production instead of resting against the softer expansion medium. On the other hand, it is achieved that when the object is hit, when the body is decelerated, the penetrator safely breaks said projectile body open at the constriction due to its inertia. This safe breakup leads to the desired splinter formation of the body. In addition, due to the longitudinal fixing of the penetrator, oscillation of the penetrator inside the projectile or the body of the projectile is prevented, which leads to improved precision of the projectile.

Another advantage of a projectile body designed in this way is the relative independence from the mechanical properties of the expansion medium. In addition, all materials and material forms already shown in DE 197 00 349 C1 can be used. In a special version, not according to the invention, an expansion medium can also be dispensed with.

The aforementioned versions are adaptable for a projectile in the caliber range of 12 to 76 mm, in particular 12.7 mm.

The invention will be described in more detail using an exemplary embodiment with a drawing.

The single figure shows a projectile 1 (frangible projectile) with a penetrator 2 encased in a projectile body 3. An expansion medium 4 is inserted in front of the penetrator in the projectile body 3. The projectile body 3 is completed by a projectile stern 5 on the rear side. The body 3 has a projectile ogive 6 on the front side. The projectile ogive 6 can preferably be joined to the projectile body 3 by means of a screw connection.

The special feature of the projectile 1 is that a constriction 7 for the penetrator 2 is introduced into the projectile body 3 (or a protrusion when viewed from the perspective of the inner diameter of the projectile body 3), on which the penetrator 2 can be supported within the projectile body 3. The constriction 7 is preferably provided in the central region 8 of the projectile body 3. The constriction 7 can also be present circumferentially in the projectile body 3. However, partial solutions are not excluded.

With the impact of the projectile 1 on an unspecified target, the projectile body 3 is decelerated. The penetrator 2, on the other hand, is moved further due to inertia, compressing the softer expansion medium 4. At the same time, the projectile body 3 breaks open at the constriction 7, resulting in a safe and desired splinter formation by the projectile body 3. If this force is sufficient, in special cases an expansion medium 4 can be dispensed with.

An alternative to the constriction in the middle region 8 of the projectile body 3 forms an off-center constriction (not shown in more detail). The principle of operation is the same as described.

Patentkrav

1. Prosjektil (1) med et prosjektillegeme (3) for mottak av en penetrator (2), med et ekspansjonsmedium (4) som er anordnet foran penetratoren (2) i prosjektillegemet (3), med en prosjektil-bak (5) og en prosjektil-ogive (6), hvor prosjektillegemet (3) er utformet som en rørseksjon, hvor prosjektillegemet (3) har en innsnevring (7) som penetratoren (2) kan støtte seg til, **karakterisert ved at** for å skape innsnevringen (7), ble en overflate til rørseksjonens indre diameteren bearbeidet fra begge sider, det vil si foran og bak, slik at innsnevringen (7) derimellom ble opprettholdt som et gjenværende område og den indre diameteren til rørseksjonen hhv. prosjektillegemet (3) er større på begge sider av innsnevringen (7) enn i innsnevringens (7) område.

2. Prosjektil ifølge krav 1, **karakterisert ved at** innsnevringen (7) er introdusert i det midtre området av prosjektillegemet (3).

3. Prosjektil ifølge krav 1, **karakterisert ved at** innsnevringen (7) er introdusert eksentrisk i prosjektillegemet (3).

4. Fremgangsmåte for fremstilling av et prosjektil (1) ifølge et av kravene 1-3, **karakterisert ved** trinnene:
- å skape prosjektillegemet (3) som en rørseksjon,
- å bearbeide overflaten til den indre diameteren til prosjektillegemet (3) fra begge sider, foran og bak, på en slik måte at en innsnevring (7) i prosjektillegemet (3) hhv. rørseksjonen blir opprettholdt.

5. Fremgangsmåte ifølge krav 4, **karakterisert ved at** innsnevringen (7) blir gjenværende i området av et sentrum (8) til prosjektillegemet (3).

6. Fremgangsmåte ifølge krav 4, **karakterisert ved at** innsnevringen (7) blir gjenværende eksentrisk i prosjektillegemet (3).

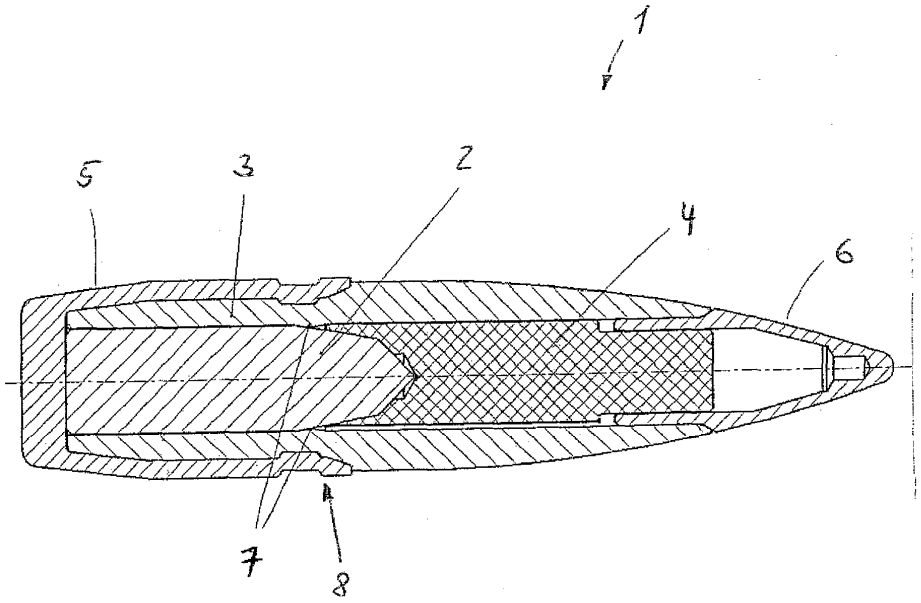

Fig. 1