

**DESCRIPTION****Warhead**

5 An explosive munition is used to attack widely different types of targets. In addition to the bombardment of buildings (infrastructure), in the case of artillery and mortar ammunition, these are so-called semi-hard targets (armored guns etc.) as well as soft  
10 targets (lightly armored or unarmored vehicles etc.). These projectiles are detonated on impact or above the target. Detonation above the target is achieved by means of a time fuze or a proximity fuze.

15 EP 1 452 825 A1 discloses a method for programming the breakup of projectiles. The detonation takes place while maintaining the optimum height with respect to the target, and at the breakup location.

20 The article "Zukunftsvision - Das Heckler & Koch OICW", Soldat und Technik ["The future vision - The Heckler & Koch OICW", German magazine Soldier and Technology], November 2001, pages 34 - 39 states that, in the "Burst Mode", the target is first of all assessed for direct  
25 flying, and the aiming device is corrected such that, when the soldier is aiming at the target, the shell has its flight path one meter above the target. The shell is then caused to detonate precisely at this point, by programming the shell with the range.

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Known explosive projectiles normally have forged projectile casings which break up into a large number of small and less large fragments on detonation. The fragment distribution can be influenced by the  
35 treatment of the steel and by so-called weak points, within certain limits. Depending on the fragment mass and the fragment speed, targets of different strength are penetrated. Increasing the proportion of large fragments leads to a reduction in the number of

fragments, and this in turn leads to a low fragment density. The fragment energy and fragment density must therefore be matched to the attack. When one wishes to attack semi-hard targets, the fragments must be of a certain size and must have a certain energy. If the fragment density is not sufficient, more ammunition is required to carry out the mission. Furthermore, only a certain proportion of the fragments are effective, because of the ballistic flight path of the projectiles, with inclined approach angle to the surface of the Earth. The effect against different targets necessitates different projectile descent angles.

Explosive projectiles are known, inter alia, from DE 602 02 419 T2, DE 601 08 817 T2, DE 20 2004 019 504 U1, DE 295 19 568 U1, DE 39 13 543 C1 and DE 196 26 660 C2.

The explosive projectile from DE 602 02 419 T2 has an explosive charge which is arranged in a casing. The casing has at least two sectors, with the first sector having means which ensure fragment formation. However, the second sector has no such means.

The explosive projectile according to DE 20 2004 019 504 U1 has an insensitive explosive charge within a projectile casing, and a concrete-breaking penetration head with an insensitive fuze.

Bomblets that are fired admittedly fall virtually vertically and are effective against semi-hard targets because they have a shaped charge on the end face, but the effectiveness of the side casing fragments is quite restrictive (DE 295 07 361U1). A large number of bomblets are therefore required for a high hit and attack probability (PS-DE 37 39 370). In practice bomblets therefore often have a low-cost fuze, which

themselves have the disadvantage that they do not always detonate, thus resulting in unexploded munitions.

5 US 5549,047 A discloses a fuze of complex design which is armed by the unfolded stabilization bands rotating a piercing unit from a safe position, thus releasing a firing capsule. During the process, a further safety pin is released, as a result of which the piercing unit  
10 is now pressed by a spring unit against the firing capsule, which has been moved under the piercing unit. This is assisted by balls which engage under a projection in the fuze housing. In the event of soft ground preventing the firing capsule from initiating,  
15 provision is made for a self-destruction mechanism to come into play, independently of the fall time and without delay after a defect of the primary initiation system. DE 100 40 800 A1 also deals with a bomblet fuze which has a safe setting, as a result of which no  
20 dangerous unexploded munitions occur.

DE 197 49 168 A1 describes a warhead for a rocket, with the object of requiring only a small number of munitions types to attack a relatively wide range of  
25 targets. The warhead proposed here is intended for attacking soft and semi-hard ground targets. As the payload the individual submunitions are in the form of disks and are provided on their end face with a fragment plate composed of preshaped fragments. After  
30 sufficient braking of the warhead, which is deployed to the target with the aid of a rocket, a warhead casing is then removed from the payload. In this case, the payload is still suspended on the braking parachute. On reaching a preselected height above the surface of the  
35 Earth a spin motor is initiated which accelerates the payload assembly to a specific rotation speed about the vertical longitudinal axis of the payload. The preselected height can be fixed in the design or can be

selected as a function of the respective terrain. On reaching a second preselected height, a blocking mechanism is unlocked, as a result of which the submunitions leave the payload carrier at their  
5 respectively instantaneous tangential velocity.

Against this background, the invention is based on the object of providing a warhead, the number and effectiveness of which can be optimized for attacking  
10 different target types.

The object is achieved by the features of patent claim 1. Advantageous refinements are specified in the dependent claims.

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The invention is based on the idea of exactly matching the warhead to the attack shortly before the mission, for example by programming. This is achieved in that the warhead is effective against semi-hard or soft  
20 targets by specific deployment of side and front fragments, depending on the detonation height. The detonation height or initiation height is signaled to the projectile, depending on the mission, for example by means of programming, and a proximity sensor in the  
25 projectile can also initiate detonation.

One warhead can therefore be used for semi-hard and soft targets, and the effectiveness at the target is governed solely by the detonation height, that is to  
30 say the detonation height for the warhead is preset on the basis of the target to be attacked.

The warhead preferably comprises a metallic casing which surrounds an explosive charge. The geometry may  
35 have different cross sections and lengths and is designed in an appropriate line for attacking the defined targets. The casing preferably comprises a cylindrical steel tube which breaks up into fragments

in a known manner when the explosive charge is detonated.

Alternatively, it is likewise possible to use casings  
5 with "preformed fragments". For this purpose, the casing is, for example, composed of individual rings, each of which is prefragmented on the inside by a large number of grooves. On the side facing the target, the casing has a prefragmented steel plate or the like. The  
10 steel plate and the side casing may be fragmented differently, in such a way that, for example, the front fragments can be used to attack semi-hard targets, and the side fragments to attack soft targets.

15 In order to allow the warhead to attack an optimum target area, the invention provides for the warhead to be equipped on the rear face with a stabilization system, for example an unfolding mechanism, bands and/or a parachute etc., thus resulting in a defined  
20 descent angle to the Earth.

The warhead can be fired into the target area in many different ways. Depending on the way in which it is fired, a plurality of warheads can be stacked in one  
25 munition, such as artillery projectiles (similar to <http://www.rheinmetall-detec.de/product.php?fid=1069&lang=2>), mortar projectiles, rockets, dispensers etc.

By way of example, the novel warhead can be integrated  
30 in the conventionally known manner in a rocket warhead with the same dimensions and ballistic characteristics. The warhead then contains a plurality of warhead units in its payload area, the number, size and effect of which are designed for the attack scenarios. They are  
35 ejected from the warhead casing at a predetermined height above the target area and then fall with a specific spatial distribution into a defined area which is predetermined by the ejection charge and the

ejection height. This area is preselected on the basis of the target type in such a way that the effectiveness radii of the individual submunitions attach, and possibly also overlap.

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In order to initiate the detonation of the explosive charge, each warhead and each warhead unit is equipped with an electronic fuze which is in turn initiated by a proximity sensor at a height above the target which can be programmed before firing or, in an alternative mode, has a fixed setting.

The advantage is that the mission can be carried out with a small number of warheads matched to their effectiveness for the attack. Reducing the number of warheads to carry out a mission now makes it possible to also use reliable fuzes, thus avoiding unexploded munitions.

A warhead is therefore proposed for attacking, in particular, semi-hard and/or soft targets, having a casing which forms fragments as well as an explosive material which is located in the casing. Furthermore, the warhead has a front plate which forms fragments, in which a proximity sensor is integrated. The rear part of the warhead contains a fuze for the firing material or explosive material, as well as a stabilization band for selecting a vertical flight path to the target, wherein the initiation of the fuze by the characteristic of the target to be attacked is governed by presetting a defined height with respect to the target.

The invention will be explained in more detail using one exemplary embodiment and with reference to the drawing, in which:

Figure 1 shows a warhead, and

Figure 2 shows a cross section through a rocket artillery warhead, with warheads as shown in Figure 1.

5 Figure 1 shows a warhead 10 with a fragment jacket 1 (casing which forms fragments), as well as a front plate 2 with preformed fragments. A proximity sensor is annotated 3. 4 denotes a physical space for a fuze 5, which is not illustrated in any more detail, as well as  
10 a stowage space for a known stabilization system (before unfolding, not illustrated in any more detail). The warhead 10 also has an explosive material 6, which is located under the fragment jacket 1 and is functionally operatively connected in the conventional  
15 manner to the fuze 5.

Once the ballistically fired warhead 10 has established a predetermined flight path to the target area, it is separated from the ballistic missile, which is not  
20 illustrated in any more detail, in such a way that its stabilization system can unfold. The warhead 10 can now descend into the target area, virtually vertically with respect to the target area. On reaching a predetermined height above the target area as confirmed by the  
25 proximity sensor 3, the fuze 5 is fired, and the fragment jacket 1 therefore breaks up. The fragment formation can be defined corresponding to the predetermined weak points in the fragment jacket 1. The front plate 3 is also likewise destroyed, and its  
30 fragment formation is enhanced by the preformed fragments that are incorporated. Side fragments and front fragments therefore act in the target area.

Figure 2 shows an artillery warhead 11 with a warhead casing 12 and the warheads 10, an ejection charge 13 as  
35 well as moldings 14 for support.

The warhead casing 12 is destroyed by the warhead units 10, which are themselves forced through the casing 12 by the ejection charge 13. Particularly in the case of an artillery projectile or mortar projectile, the warhead units 10 are ejected to the rear. The operation of the individual units 10 is then the same as that described in Figure 1.

**PATENT CLAIMS**

1. A warhead (10) for attacking, in particular, semi-hard and/or soft targets, having a casing (1) which  
5 forms fragments, as well as explosive material which is located in the casing (1), having a front plate (2) with fragment formation, a proximity sensor (3), a fuze (5) for the explosive material and a stabilization band for setting a vertical flight path to the target,  
10 wherein initiation of the fuze (5) by the characteristic of the target to be attacked is governed by presetting a defined height with respect to the target.
- 15 2. The warhead as claimed in claim 1, characterized in that the casing (1) which forms fragments is a fragmentation jacket.
3. The warhead as claimed in claim 1, characterized  
20 in that the casing (1) which forms fragments is a casing with preformed fragments.
4. The warhead as claimed in one of claims 1 to 3, characterized in that preformed fragments are  
25 incorporated in the front plate (2).
5. The warhead as claimed in one of claims 1 to 4, characterized in that the casing (1) has weak points.
- 30 6. An artillery warhead (11) having a projectile casing (12), an ejection charger (13) and warheads (10) as claimed in one of claims 1 to 5, which are surrounded by the projectile casing (12).
- 35 7. A mortar projectile having warheads (10) as claimed in one of claims 1 to 5.

8. A rocket warhead having a projectile casing (12), an ejection charge (13) and warheads (10) as claimed in one of claims 1 to 5, which are surrounded by the projectile casing (12).

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9. A dispenser having warheads (10) as claimed in one of claims 1 to 5.