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LONG-BURNING PYROTECHNIC MATERIAL CONTAINING DEPLETED URANIUM FOR SPOTTING RIFLE PROJECTILES

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2 Claims. (Cl. 149—42)

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to me of any royalty thereon.

This invention relates to a long burning pyrotechnic material for spotting rifles which are usually mounted on a larger caliber weapon, and has for an object to provide such a material which will assist in providing a projectile better adapted for use in spotting rifles than have those heretofore used and providing a projectile having a trajectory more closely approaching what has long been desired in similarity in shape the trajectory for the projectile fired by the larger gun.

A spotted rifle has usually been mounted on and above a major caliber weapon for the purpose of quickly and easily getting on a target with the smaller gun before the larger gun is fired. The usefulness of the smaller projectile is a maximum when its trajectory is the same in shape as that of the larger gun projectile for average if not for all ranges because only then may the two guns be moved together as a unit in getting on the target quickly without complications in a mounting or corrections for the smaller gun. The difference in the trajectories of these two guns is referred to as degree of mismatch. Efforts have been made to reduce this degree of mismatch to as low a value as is possible. The reason is that the smaller caliber projectile is used for visually locating the target and usually carries both a tracer and incendiary material for that purpose. Once the small projectiles are bursting on or close to the target, a correction for trajectory can be made and the larger gun fired. The closer the trajectories of the large and small guns are, the greater the probability of striking the target. The solution for the reduction in mismatch has been complicated. It is not a mere matter of increasing the velocity of the spotting projectile. Neither can it be viewed simply as increasing the weight of the projectile by increasing its length. Practicable ballistic limits have been empirically determined for muzzle velocity for a given size of projectile. Likewise limits in length have been empirically found for a given diameter of projectile. It has been found desirable to keep the spotting projectile as small as possible for many reasons.

According to this invention a practicable way has been found for increasing weight of a spotting projectile for its present volume to reduce mismatch. Specifically it has been found practical ballistically to substitute uranium for the pyrotechnic metals such as magnesium, titanium, aluminum, or zirconium heretofore used or suggested for spotting projectiles. More specifically from about 5% to 75% by weight of uranium having a particle size of 20 to 60 mesh in the United States Standard Sieve Series has been found suitable for long burning pyrotechnic material for the spotting projectile. It was found uranium was no more difficult to ignite than the zirconium or titanium in particles of the same size, although it did need the powdered alloy and oxidizing materials previously used. An intermediate priming material was found in a 50–50 powdered alloy of magnesium and aluminum in about 47½% to 12½% by weight with about 47½% to 12½% of an oxidizing material such as potassium perchlorate, barium nitrate, or ammonium nitrate. The powdered alloy is preferably present in about equal parts by weight of the oxidizing material, and the balance being uranium in the 20 to 60 mesh particle size. Other oxidizing materials than those mentioned have been found suitable in the present pyrotechnic composition for spotting rifle projectiles. The alloy powder is in the usual size in which it has been used in incendiary and other pyrotechnic materials.

The common metal powders used for pyrotechnic or spotter displays at the target are magnesium and aluminum, which have densities of 1.7 and 2.7 respectively. Uranium metal powder being better for pyrotechnic purposes depending upon the exact use has a density of 18.7 or over 9 times that of magnesium, 4 times that of titanium, and 3 times that of zirconium. This increase in pyrotechnic composition weight is directly reflected in an increase in ballistic coefficient of the spotter shell and within a given shell design the improvement in mismatch is related to the weight increase. Therefore substituting uranium for zirconium of equivalent particle size in the pyrotechnic composition does result in a substantial improvement for mismatch in a spotter shell. One of the principal factors in increasing the ballistic coefficient of the small round is weight. Weight is difficult to harmonize with all other desired characteristics. This is why any increase in weight which may be obtained in the interior volume of the small spotting shell normally allotted to pyrotechnic explosives is highly desirable. The size and duration of pyrotechnic display are important elements of an incendiary composition. With the depleted uranium composition the size of the pyrotechnic display was substantially equal to that of the preferred zirconium metal fuel under the same conditions. Burst durations of 300 to 350 milliseconds have been obtained in .50 caliber rounds.

The depleted uranium from which uranium 235 and other materials have been removed is suitable for use in the present invention. Large surplus piles of this depleted uranium are accumulating. Gamma radiation from this depleted uranium is at a safe low level, well within the prescribed safety limits, and on following the normal health precautions prescribed, processing of this depleted material should be completely safe.

With the uranium containing projectile of this invention it is possible for the first time to take advantage of the good effect in pyrotechnic display plus a better match between major caliber weapon using a minor caliber spotting rifle.

I claim:

1. A spotting rifle projectile pyrotechnic composition consisting of about 5% to 75% by weight of depleted uranium of about a 20 to 60 mesh particle size, between about 47½% to 12½% by weight of a powdered 50–50 alloy of aluminum and magnesium, and between about 47½% to 12½% by weight of a powdered oxidizing material from the class consisting of potassium perchlorate, barium nitrate, and ammonium nitrate.

2. A composition according to claim 1 in which said uranium is about 50% by weight of the composition; the balance being about 25% by weight of the oxidizing material, and about 25% by weight of said powdered aluminum-magnesium alloy.

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