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INCENDIARY COMPOSITION

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2 Claims. (Cl. 52—24)

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

This invention relates to incendiary compositions, and more particularly to incendiary compositions having superior burst size and duration, and consistency of ignition.

One of the biggest problems encountered when incendiary projectiles are employed against aircraft targets is the rapid burning of the incendiary composition. This rapid burning causes the incendiary mixture to burn out before reaching the protected fuel cells, or be so reduced in intensity that the fuel cannot be ignited. Because of this problem, effectiveness of incendiary projectiles is dependent upon size, temperature, duration of burst, and type of ignition mixture.

An object of this invention, therefore, is to present an improved incendiary composition far superior to prior compositions with regard to size and duration of burst, such that the ultimate targets may be consistently defeated.

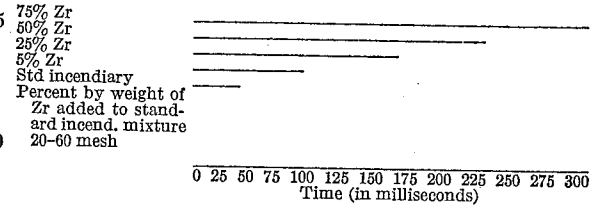
In the present state of technological advancement in the field of pyrotechnics, there are no established rules or laws based on the physical and chemical properties of metals which would permit the selection of a particular metal having a given particle size and be able to predict the burning rate under operational conditions. It is known that the burning rate is affected by surface area, particle size, irregularity or roughness of surface, porosity of the particles, etc. General principles indicate that under most conditions of use, a decrease in particle size results in an increased burning rate. Conversely, larger particles burn longer. Thus, it appears to be a simple expedient to select a larger particle size and obtain a longer burst duration. However, this is not true. A metal such as zirconium in small particle size is faster burning than the same size particles of other metals, yet when the particle size of zirconium and the other metals is increased their relationship is changed entirely, and zirconium burns longer.

Zirconium has been used as a fuel for primer compositions, in the particle size of about 3 to 10 microns. In this size zirconium exhibited rapid burning characteristics. However, because of the lack of a common base for correlating metals as to their pyrotechnic effect under operational conditions there was nothing to indicate how zirconium would perform in larger particle size. In fact, there was no zirconium available in the particle size desired to be tested, and several existing processes had to be modified and combined in order to produce the desired particle size.

The initial tests with zirconium resulted in a conclusion that it was not satisfactory in the particle size of 20–60 mesh, in the U.S. Standard Sieve Series, as it was difficult to ignite. However, I have discovered that when zirconium having a particle size of 20–60 mesh is finally ignited in a proper manner, there is a completely unexpected result. That is, there results a burst which is longer and larger in duration than any of the metals commonly encountered to date.

I have also discovered that projectiles containing the new zirconium mixture perform more consistently, and have burst size and duration far in excess of the best prior art projectiles, as will be shown below.

The incendiary compositions which employ my concept, must contain a suitable medium for igniting the zirconium. I have not been able to discover what factor contributes most to good ignition of the zirconium, but I have achieved a satisfactory mixture by using equal quantities by weight of an oxidizing agent such as potassium perchlorate or barium nitrate or ammonium nitrate and a 50/50 alloy of magnesium and aluminum as a preliminary fuel. As little as 5% zirconium by weight to the igniting constituents yield a burst duration about 100% better than the standard incendiary projectile. As the amount of zirconium is increased, the improvement is magnified, until at 75% zirconium, my new mixture has a burst duration 1000% superior to the standard projectile.



I have found that when using the magnesium aluminum alloy with potassium perchlorate, a maximum of 75% zirconium can be used, beyond which consistency in ignition cannot be achieved. When using particles smaller than 60 mesh in size, the mixture burns more rapidly and a marked reduction in burst duration results. When using particles larger than 20 mesh in size, the mixture becomes less sensitive and there is a tendency for the zirconium to segregate out of the mixture.

The scope of my invention should not be limited by or to the examples given. For instance, any compound which will satisfactorily ignite the zirconium could be substituted for the magnesium/aluminum alloy-potassium perchlorate constituents.

I claim:

1. An incendiary composition yielding prolonged burst duration consisting of not more than about 75% by weight zirconium having a particle size of about 20 to 60 mesh and a mixture for igniting said zirconium consisting of about 12.5% to 47.5% by weight metallic fuel consisting of about a 50/50 alloy of magnesium-aluminum and about 12.5% to 47.5% by weight of an oxidizing agent from the class consisting of potassium perchlorate, barium nitrate, and ammonium nitrate.

2. An incendiary composition yielding prolonged burst duration consisting of about 75% by weight zirconium having a particle size of about 20 to 60 mesh, about 12.5% by weight of a 50/50 alloy of magnesium-aluminum as a preliminary fuel and about 12.5% by weight potassium perchlorate as an oxidizing agent, whereby a sustained burning of about 300 milliseconds is achieved.

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