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GASLESS IGNITION COMPOSITION FOR SOLID
ROCKET PROPELLANTS

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assignments, to the United States of America as repre-
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4 Claims. (Cl. 149-41)

This invention relates to a gasless ignition charge for solid rocket propellants made entirely of noncritical inexpensive materials.

Prior to this invention difficulty and non-uniformity resulted in the ignition of rocket propellant igniters. Igniters of the prior art were characterized by erratic ignition over wide temperature ranges (from -100° F. to 200° F.) so that under-ignition resulted at low temperatures and high pressures while over-ignition occurred at high temperatures.

The primary object of the present invention is to produce a uniformly burning gasless propellant igniter.

Another object of this invention is to produce an igniter which will satisfactorily operate in a temperature range from -100° F. up to 200° F.

Other and further objects and advantages will become apparent to those skilled in the art from the following examples and disclosure.

I have discovered novel gasless igniter compositions which are advantageously employed for the ignition of solid rocket propellants. Ignition is accomplished by a conventional electric squib or match which ignites the igniter composition, which in turn ignites the larger solid propellant charge. Location of the igniter is generally at the head end of the grain, but may be at the nozzle end of the grain in the case of end-burning grains. The beneficial advantages displayed by this igniter composition arise from the ignition and combustion of the propellant surface rather than the igniter itself, to provide the gas necessary to create the initial pressure in the chamber.

The igniter powder is made by tumbling the powdered metallic fuel with the granular inorganic oxidizing salts in a "sweetie barrel" in an inert atmosphere and under carefully controlled conditions to prevent static discharges. The composition may be used in either the original powdered form or a tablet form which is made in a conventional tableting press using the powder alone or the powder mixed with an amount (usually not more than about 3 percent by weight) of an organic binder material sufficient to agglomerate the ingredients. Examples of suitable binders are cellulose acetate or ethyl cellulose.

The particular novelty of the present invention resides in the large amount of iron used for metallic fuel. Iron powder displays greater radiant energy output over the entire spectral range than any other metal. While pow-

dered iron is the major component of the present composition, minor amounts of various other metals may be supplementally added in amounts up to about 5 percent by weight to produce desired performance characteristics in the igniter. Magnesium, aluminum, cobalt, boron, zirconium, nickel-zirconium alloys, iron chromium, and mixtures thereof exemplify the type of supplemental metal powders which may be employed in this composition. Alkali and alkali metal nitrates and perchlorates furnish a source of oxygen for the metallic fuel so that high temperature combustion will produce hot particles of metallic oxides which form ignition sources on the propellant surface. Stoichiometric proportions or over-oxidized proportions, i.e., an oxygen balance a little over the stoichiometric point, produce the most efficient igniters.

The following is a table illustrating a few of the practical embodiments of the present invention.

Component	Percentage by Weight			
	(1)	(2)	(3)	(4)
KClO ₄	45	44	44	39
Fe.....	55	53	53	56
Mg.....		3		5
Al.....			3	

A black powder booster may be added to the above compositions in varying amounts up to 5 percent by weight, depending on the power of the squib used. With a powerful squib the black powder may be eliminated.

It is to be understood that various modifications and extensions may be effected without departing from the scope and novel concept of the present invention.

I claim:

1. An igniter composition for a solid rocket propellant consisting essentially of powdered iron of a major amount by weight and potassium perchlorate.
2. An igniter composition in accordance with claim 1 including a small amount of a supplemental metal.
3. An igniter composition in accordance with claim 1 including up to 5% of black powder.
4. An igniter composition in accordance with claim 1 including an organic binder in an amount sufficient to agglomerate the powdered iron and salt.

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