POLYMERIC BASE PROPELLANT COMPOSITIONS CONTAINING LITHIUM FLUORIDE CATALYST

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4 Claims. (Cl. 49—19)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention herein described may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to a novel solid propellant composition, and more particularly to a solid propellant composition with a plate type burning characteristic.

The velocity at which a solid propellant is consumed during operation is called the burning rate. It is measured in a direction normal to the propellant surface and is usually expressed in inches per second. Most of the new propellant compositions which have been developed within recent years do not possess burning-rate characteristics comparable to those of the "old-fashioned" compositions; that is, the logarithmic plot of burning-rate versus pressure no longer assumes a straight line called "linear" burning; but instead "messy" and "plateau" burning have appeared. A plateau-burning propellant is one for which the logarithmic plot of burning-rate versus pressure deviates from that of linear in the following manner. At low pressures, the burning-rate-pressure relationship is generally linear with a moderately high pressure exponent. This is followed by a pressure range where the burning rate becomes nearly constant. Finally, the burning rate becomes about as sensitive to changes in pressure as it was at the low pressure. Significant advances have been made in improving solid propellant burning-rate characteristics by modification of the composition. The general purpose of the present invention is to blend lithium fluoride with an inorganic oxidizer, a polymerizable organic molecular resin such as one of the condensation polymers of epichlorohydrin and bisphenol A (sold under the tradename Epon 828) to form a rocket propellant composition exhibiting the plateau burning phenomenon. It is therefore an object of this invention to provide a new propellant composition having a controlled burning rate.

Another object of this invention is to provide a propellant composition having improved physical properties. Yet another object is to provide a propellant which will find use in rocket motors of simplified design.

Other objects, features and many of the attendant advantages of this invention will become more evident as the same become better understood by reference to the following description.

The example given herein is a typical formulation wherein lithium fluoride apparently influences the burning rate.

Ingredients: Percent by weight

- Ammonium perchlorate .................................. 75
- Polybutyl acrylic acid terpolymer ..................... 20.4
- Epichlorohydrin and bisphenol resin .................. 3.6
- Lithium fluoride (powder) .............................. 1

The oxidizer used above was made up of ammonium perchlorate of the following three particle sizes:

- 10 weight percent about 65µ
- 50 weight percent about 93µ
- 90 weight percent about 130µ

The above ingredients were blended in a mixer until homogeniety resulted. The mixture was then cast into the desired configurations and cured for several days at about 130°F.

It is possible that the coarse ammonium perchlorate and a little lithium fluoride will change many composite propellant compositions to plateau-burning types. Obviously many modifications and variations are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A propellant composition consisting essentially of the following ingredients:

   Ammonium perchlorate
   Lithium fluoride
   Polybutyl acrylic acid terpolymer
   A resin consisting of a condensation product of epichlorohydrin and bisphenol A.

2. The composition of claim 1 wherein the ammonium perchlorate comprises a mixture of particle sizes of about 10 weight percent of 65µ

3. A propellant composition consisting essentially of the following:

   Ingredients: Percent by weight

   - Ammonium perchlorate .................................. 75
   - Lithium fluoride ............................... 1
   - Polybutyl acrylic acid terpolymer ..................... 20.4
   - Resin consisting of epichlorohydrin and bisphenol .............................. 3.6

   No references cited.