CLAIMS

What is claimed is:

1. A method of manufacturing a multi-layered propellant grain comprising the following steps:

providing a first formulation; said first formulation being in the range of viscosity similar to common propellant dough;

providing a die configured to shape a structure having an outer shell and a hollow interior when material is extruded therethrough;

extruding the first propellant formulation through said die, to produce a first propellant layer having an outer shell defining a hollow interior in the form of a passageway having open ends;

providing a second propellant formulation; wherein the second formulation composition is close to a gel, a liquid or a paste. Said second propellant formulation viscosity being at least fifty times less viscous than the first formulation;

injecting said second propellant formulation into said passageway defined by said first propellant layer to form a second propellant layer disposed in said passageway, wherein the said injecting of said second propellant formulation is performed at substantially the same time as the said extruding of said first propellant formulation and;

hardening or curing of the said second propellant layer,

wherein the first and second propellant layers have different rates of burning.

2. The method according to claim 1 wherein the viscosity of the said second propellant

3. The method according to claim 1 wherein the first propellant layer is shaped as tube.

4. The method according to claim 3 wherein the propellant grain produced is composed of two concentric cylinders.

5. The method according to claim 1 wherein the first propellant layer is a slow burning layer composed of about 55% nitrocellulose and about 45% trimethylolethane trinitrate (TMETN).

CLAIMS

What is claimed is:

1. A method of manufacturing a multi-layered propellant grain com ising the following steps:

providing a first formulation; said first formulation being in the ra e of viscosity similar to common propellant dough;

providing a die configured to shape a structure having an outer s ell and a hollow interior when material is extruded therethrough;

extruding the first propellant formulation through said die, to pro ce a first propellant layer having an outer shell defining a hollow interior in the form c a passageway having open en

providing a second propellant formulation; wherein the second fc nulation composition is close to a gel, a liquid or a paste, said second propellant formula on viscosity being at least fifty times less viscous than the first formulation;

injecting said second propellant formulation into said passagewa defined by said first propellant layer to form a second propellant layer disposed in sa passageway, wherein the said injecting of said second propellant formulation is perforn d at substantially the same time as the said extruding of said first propellant formulatic and;

hardening or curing of the said second propellant layer.

wherein the first and second propellant layers have different rate of burning.

2. The method according to claim 1 wherein the viscosity of th said second propellant formulation is in the range of about 0 to about 2000 pascal·seconds.

3. The method according to claim 1 wherein the first propellant lay is shaped as tube.

4. ~~The method according to claim 3 wherein the propellant grain p duced is composed of~~ two concentric cylinders.

5. The method according to claim 1 wherein the first propellant layer is a slow burning layer composed of about 55% nitrocellulose and about 45% trimethylolethane trinitrate (TMETN).