

[54] CONDUCTIVE IGNITER COMPOSITION

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[56]

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ABSTRACT

A conductive igniter strand comprising a mixture of Viton, Teflon, magnesium and graphite which reduces the dangers from electrostatic discharge and at the same time provides adequate ignition.

3 Claims, No Drawings

CONDUCTIVE IGNITER COMPOSITION

BACKGROUND OF INVENTION

The invention relates to an improved igniter strand; more specifically an igniter composition which can be extruded into an electrically conductive strand.

Prior state-of-the-art igniter compositions comprising a fluorocarbon binder and magnesium have been extruded into strands and used in destruct systems on various ordnance items such as balloon flare systems, etc. Although such strands are safe to work with under normal conditions, personnel have been injured by the electrostatic charges built up while these prior art composition strands were being rigged into nylon balloons. Since the igniter compositions used to produce these strands were not conductive, there was no way to bleed off the electrostatic charge. The present improved igniter strand comprises a mixture which extrudes well into a good conductive product thereby preventing dangerous electrostatic charge build up. It is also slower burning giving the personnel a change to get

ton-Teflon and magnesium to which graphite at the 0.8, 12, 16, 20, and 24 percent level was added. Graphite was the additive selected from several tried to obtain the desired electrical conductivity and burning rate characteristics.

All additives tried except the graphites greatly increased the difficulty of extrusion. There was no significant conductivity until the 16 percent graphite level was reached. There was a great decrease in electrical resistance by increasing the graphite level from 16 to 20 percent. There was very little change in conductivity by increasing the graphite level from 20 to 24 percent and graphite loaded mixes processed very well. The extrusion pressures for the graphite mixes was between about 9,000 and 10,000 psi for a rate of about 30 inches per minute.

The following table gives results of various mixtures which can be compared with the strands consisting of a mixture of Teflon, Viton, magnesium and graphite found by applicants to possess good conductive characteristics as well as being extrudable and reliable.

TABLE I—COMPOSITION (PERCENT BY WEIGHT)

Sample	Viton	Teflon	Magnesium	Additive	Results
7037	16	30	52—gran 16.....	Furnace black, 16.....	Did not conduct.
7038	16	30	52—gran 16.....	Al fibers, 1.....	Do.
7040	16	30	44—gran 16.....	Thermal black, 10.....	Do.
7041	16	30	44—gran 16.....	Thermal black, 4; graphite, 4; Al fibers, 2.	Conductive but too high extrusion pressure.
7048	16	30	46—gran 17.....	Graphite, 4; thermal black, 4.	Conductive but too high extrusion pressure burned too slow.
7051	16	30	52—gran 17.....	Thermal black, 2.....	Nonconductor.
7056	16	30	42—gran 15.....	Graphite, 12.....	Nonconductive.
7057	16	30	38—gran 15.....	Graphite, 16.....	Conductive, but burned too slow.
7058	16	30	34—gran 15.....	Graphite, 20.....	Conductive.
7061	16	30	30—gran 16.....	Graphite, 24.....	Good conductor, pressure and extrusion rate.
7063	16	30	34—gran 16.....	Graphite, 20.....	Excellent conductor, and good extrusion.

away in case of fire.

DESCRIPTION OF INVENTION

In accordance with this invention a mixture consisting essentially of about 16 percent by weight Viton, 30 percent by weight Teflon, 30 to 34 percent by weight magnesium, and 20 to 24 percent by weight graphite was prepared by the shock-gel process. The process may be described generally as follows:

Viton, the tradename for the copolymer of vinylidene fluoride and hexafluoropropylene, is dissolved in acetone to form a solution which may range from 8 to 20 percent solids. The required quantities of magnesium, Teflon (tradename for polytetrafluoroethylene) and graphite are stirred into an appropriate quantity of Viton solution. The hexane is quickly added to a large volume of the rapidly agitating slurry. By this treatment all of the material is precipitated in a granular form. After one or more washes with additional hexane, the material is collected and dried. The material is then placed in the extrusion press and extruded into the appropriate sized strand. The extrusion pressures and flow rates are dependent upon the total binder content, the Viton to Teflon ratios, the particle size of the magnesium and graphite, the ratio of die area to barrel area in cross section and the shape and design of the die used.

A series of igniter mixtures were made containing Vi-

The preferred strand mixture comprises 16 percent by weight Viton, 30 percent by weight Teflon, 34 percent by weight magnesium and 20 percent by weight graphite. This mixture extrudes well and exhibited the best conductive characteristics of the many mixes. The destruct strands used in a flare lighting system are being prepared from this particular formulation. The strand burns at a rate of between 0.5 and 1.0 ft./sec. which gives assembly personnel ample time to step back from the immediate vicinity of the burning strand should ignition take place. The prior art fluorocarbon strand which was previously used had a burn rate of 20–30 ft/sec. so that when combustion occurred there was no time for the workers to escape.

The magnesium used herein has a nominal particle size from 34 to 74 μ . Magnesium of 5 μ size is very sensitive to electrostatic ignition.

Most of the mixes were made with 3 μ graphite, which is the preferred particle size. One mix made with 1 μ graphite at the 24 percent level resulted in a product that was very difficult to extrude, and the conductivity decreased by a factor of between eight and ten, and the burning rate increased from 0.3 to 0.4 ft/sec.

The 20 percent graphite level is about the lowest loading which will give a reliable quickly extrudable conductive product and 3 μ particle size with the 16 gran magnesium (ranging from 10 to 200 μ being preferred.

What is claimed is:

1. A fluorocarbon igniter strand which bleeds off electrostatic buildup and thereby prevents accidental ignition due to discharge sparks, and consisting essentially of a mixture of the following:

Ingredients	Percent by Weight
Polytetrafluoroethylene	26 to 34
Copolymer of hexafluoropropylene and Vinylidene-fluoride	12 to 20
Magnesium	30 to 38
Graphite	24 to 16.

2. The strand in accordance with claim 1 wherein the mixture consists essentially of 30 percent polytetrafluoroethylene, 16 percent of the copolymer of hexafluoropropylene and vinylidene fluoride, 34 percent magnesium and 20 percent graphite.

3. The strand in accordance with claim 2 wherein the magnesium ranges in particle size from 10 - 200 μ , and the graphite has a nominal particle size of 3 μ .

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