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IGNITION COMPOSITION

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This invention relates to the art of ignition compositions of the type particularly adapted for use in blasting initiators.

Ignition compositions containing certain nitrocellulose ingredients including ground "Pyro" smokeless powder and the like are known in the art of blasting initiator manufacture. However, certain disadvantages are inherent in the compositions heretofore employed.

The object of the present invention is an ignition composition for blasting initiators, containing an improved form of nitrocellulose. A further object is an improved ignition composition of reduced hygroscopicity. Other objects will be appreciated from the following detailed description of the invention.

I have found that the foregoing objects are attained by means of an ignition composition comprising colloided nitrocellulose characterized by a nitrogen content substantially greater than that of the well-known "Pyro" nitrocellulose and preferably having a nitrogen content of at least approximately 13.15%. My preferred embodiment comprises base grain smokeless powder containing nitrocellulose having a nitrogen content of 13.15%. For instance, it is quite desirable to employ colloided nitrocellulose, a preponderant amount of which is high grade having a nitrogen content of about 13.4%, the remainder having perhaps a lower nitrogen content, even as low as that of "Pyro," namely 12.6%, so that the overall nitrogen content is in the neighborhood of 13.15%. However, I find it advantageous, likewise, to employ said nitrocellulose treated with a substantially non-volatile ester of an organic acid, which is capable of exerting a solvent action on said nitrocellulose. For instance the invention could include said nitrocellulose treated with the dialkyl phthalates such as dibutyl phthalate, diethyl phthalate and the like, dialkyl tartrates such as dibutyl tartrate, various palmitates; e. g. ethyl palmitate, acetyl laurine and the like. These esters are liquids at ordinary temperatures and are characterized by a relatively high boiling point, and possess the requisite solvent action with respect to the nitrocellulose. In treating the nitrocellulose of the preferred nitrogen content with these esters, I find it advantageous to form an intimate admixture of the nitrocellulose with the ester in the presence of a volatile solvent which can subsequently be eliminated readily. For instance the ingredients may be kneaded in the presence of a volatile solvent such as acetone, ether-alcohol, or the like, by mixing them in a mixer of the kneading type. The volatile solvent is then removed and recovered in known manner and the colloid reduced to finely-divided grains.

Preferably, I also add to the admixture a polynitrotoluene which aids in the reduction of the hygroscopicity and also serves as a plasticizer. Dinitrotoluene has been found to be particularly effective. Trinitrotoluene is also suitable.

I find that nitrocellulose compositions prepared as described are highly satisfactory for incorporation in ignition compositions generally, especially for blasting caps, squibs, and the like. They are especially satisfactory in ignition compositions of the type comprising an intimate mixture including in addition to the nitrocellulose an oxidizer such as potassium chlorate for example, and lead sulfocyanate. I may also employ my nitrocellulose compositions together with an oxidizer and lead nitrato-bis basic lead dinitro-ortho-cresylate.

The ignition compositions according to the present invention constitute a marked improvement over the ignition composition of the prior art of the type containing the so-called "Pyro" smokeless powder. For instance, the compositions of the invention show a much lower hygroscopicity than the "Pyro" composition. The following table shows a comparison of the moisture pick-up of "Pyro" powder with that of the powder employed in the ignition compositions of the present invention.

Table I

Composition of nitrocellulose	Moisture content
	Per cent
12.0% nitrogen	2.55
12.6% (Pyro) nitrogen	2.00
13.0% nitrogen	1.6
13.15% (base grain) nitrogen	1.5
13.4% nitrogen	1.3
13.15% nitrogen + 10% dinitrotoluene + 5% dibutyl phthalate	0.62
13.15% nitrogen + 10% dinitrotoluene + 3% dibutyl phthalate	0.67

In each case in the above table the colloided nitrocellulose had been reduced to such finely divided condition that substantially all of the material passed a 100-mesh standard screen. The results show the moisture content attained after the samples had been subjected to 70% relative humidity at a constant temperature of 30° C., until they no longer showed a gain in moisture content.

In view of the fact that the other ingredients of ignition compositions are generally much less

hygroscopic than the nitrocellulose, the moisture absorption of the entire composition is effected most by the hygroscopicity of the particular nitrocellulose employed. This is indicated by the following example.

Example

Samples of an ignition composition composed of 50 parts by weight of colloided nitrated carbohydrate, 25 parts of lead nitrato-bis basic lead dinitro-ortho-cresylate, and 25 parts of potassium chlorate were stored at 100° C. and 100% relative humidity in order to determine the moisture pick-up under these conditions. In one group (A) of samples, the solid nitrated carbohydrate consisted of pyro nitrocellulose which has a nitrogen content of 12.60%. The solid carbohydrate of the second (B) consisted of 87 parts of nitrocellulose of 13.15% nitrogen content, 10 parts of dinitrotoluene and 3 parts of dibutyl phthalate.

Composition	Moisture content (average) after—		
	3 days	6 days	9 days
A	1.66		
B	.46	.48	.53

The reduction of the moisture pick-up, effected by adoption of the compositions of the present invention, instead of the pyro nitrocellulose known to the art, is illustrated by the foregoing results.

By means of the ignition compositions according to my invention it is possible to avoid all the difficulties of the prior art which were due to the presence of high moisture content. Thus when such a composition is used in a blasting initiator, corrosion of the metallic components is effected. Furthermore, it is not necessary to exercise the precautions heretofore considered to be essential to insure the charging of a composition of a moisture content below an established maximum. Moreover, the possibility of misfire of the initiator, due to the moisture absorption during storage, is eliminated.

Variations may be made without departing from the scope of the invention. I intend to be bound only in accordance with the following claims.

I claim:

1. An ignition composition for blasting initiators and the like comprising a colloided nitrocellulose composition characterized by a nitrogen content of at least approximately 13.15%.

2. An ignition composition for blasting initiators and the like comprising colloided nitrocellulose having a nitrogen content of at least approximately 13.15% intermingled with a substantially non-volatile water insoluble ester of an organic acid, said ester having a solvent action on said nitrocellulose.

3. An ignition composition for blasting initiators and the like comprising colloided nitrocellulose having a nitrogen content of at least approximately 13.15% intermingled with a substantially non-volatile water insoluble ester of an organic acid, said ester having a solvent action on said nitrocellulose, and a stable polynitrotoluene.

4. An ignition composition comprising colloided nitrocellulose having a nitrogen content of at least approximately 13.15%, containing dialkyl phthalate and a stable polynitrotoluene.

5. The ignition composition of claim 4 wherein the dialkyl phthalate is dibutyl phthalate.

6. The ignition composition of claim 4 wherein the polynitrotoluene is dinitrotoluene.

7. An ignition composition comprising 80 to 90 parts of colloided nitrocellulose having at least approximately 13.15% nitrogen, and containing from 5 to 15 parts of dinitrotoluene and from 1 to 10 parts of dibutyl phthalate.

8. An ignition composition comprising 85 parts of colloided nitrocellulose having at least approximately 13.15% nitrogen, and containing 10 parts of dinitrotoluene and 5 parts of dibutyl phthalate.

9. An ignition composition for blasting initiators and the like, comprising a colloided nitrocellulose composition having an average nitrogen content of at least 13.15% but containing a nitrocellulose portion having a nitrogen content of at least approximately 13.4%.

10. An ignition composition for blasting initiators and the like, comprising colloided nitrocellulose consisting approximately of 2 parts of nitrocellulose having a nitrogen content of 13.4% and approximately 1 part having a nitrogen content of approximately 12.6%.

11. An ignition composition for blasting initiators and the like comprising a colloided nitrocellulose composition characterized by a nitrogen content of at least approximately 13.15%, an oxidizing agent, and an additional fuel selected from the group consisting of lead sulfocyanate and lead nitrato-bis basic lead dinitro-ortho-cresylate.

12. An ignition composition for blasting initiators and the like comprising a colloided nitrocellulose composition characterized by a nitrogen content of at least approximately 13.15%, and an oxidizer.

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