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PROPELLANT POWDER

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to a propellant powder.

Modern propellant powders, in addition to being smokeless, are required to be non-hygroscopic, non-volatile and flashless. These additional requirements make much more difficult the formulation of compositions which will also meet ballistic requirements. In the past, there have been two essential types of smokeless powders, the straight nitrocellulose powder containing a volatile solvent as colloiding agent, and double base powders in which nitrocellulose is colloided with nitroglycerine. The first type of powder composition mentioned has appreciable volatility, is very hygroscopic and produces a large flash at the muzzle of guns. The nitroglycerine-nitrocellulose powders on the other hand are relatively non-volatile and non-hygroscopic but are not superior to the straight nitrocellulose type in regard to the flash produced.

One means of reducing the flash from nitrocellulose powders is to incorporate inert compounds in the powder. The decomposition of these inert compounds consumes sufficient heat that the temperature of the gases issuing from the muzzle of the gun is reduced below the ignition temperature of the gases and hence no flash is produced. This is a very satisfactory means of reducing flash but it has limitations in other directions in that the addition of inert compounds may reduce the potential of the powder to such an extent that the desired ballistics cannot be obtained.

It would be highly desirable to have a compound available which would act as a colloiding agent for nitrocellulose and at the same time provide a powder which would be non-hygroscopic, non-volatile, smokeless and flashless. Certain nitroaromatic compounds have been employed in the past in an attempt to provide such a powder but distinct weaknesses can be cited against the use of any of such compounds employed in the past if judged by their suitability in fulfilling all the requirements of the powder set forth above. Thus, all mononitro compounds employed in the past, while imparting favorable properties such as non-hygroscopicity, non-volatility and a certain tendency to reduce flash, have the objectionable feature of being practically inert and reducing the energy content of the powder in proportion to the amount used. The dinitroaromatic compounds which have been used in propellant powders are crystalline bodies and are, therefore, not colloiding agents for nitrocellulose at ordinary temperatures. In addition, although they impart greater potential to a powder than the mononitro compound, they have less potential than pyrocellulose and their use with the latter must, therefore, of necessity, reduce the potential of a powder in proportion to the percent used in a basic nitrocellulose composition. The trinitro compounds which have been used have the high potential desired but they are crystalline and hence are not colloiding agents for nitrocellulose at the temperatures at which powders are manufactured and do not function as well as desired in reducing the hygroscopicity of a powder or in reducing the flash.

Thus, past experience has not yielded a single compound which, when added to nitrocellulose, will give a powder composition that will meet to a satisfactory degree all the requirements now demanded. I have discovered however, a means of accomplishing this end by providing mixtures of nitro compounds which are liquids at ordinary temperature; which have a higher nitrogen content, i. e., potential than any single liquid nitro compound; which impart the properties of non-volatility, non-hygroscopicity and flashlessness to nitrocellulose powders. These mixtures are distinctly superior in this regard to any nitro compound that has previously been used with propellant powders in that these essential requirements are met without detracting appreciably from the energy content or potential of the nitrocellulose. They are, in effect, double base powders in which the objectionable features of

nitroglycerine have been eliminated by substituting a liquid mixture of nitro compounds for nitroglycerine.

Examples of compositions which have been prepared and demonstrated by firing tests and chemical tests to meet the requirements mentioned above are cited as follows:

	Per cent
a. Nitrocellulose	85
Trinitrotoluene	5
Mononitrobenzene	10
b. Nitrocellulose	80
Trinitrotoluene	15
Mononitrobenzene	5

As a general proposition it may be stated that the TNT may be present in amounts from 5 to 15% and the mononitrobenzene in amounts from 2 to 10%.

The advantage of mononitrobenzene over the mononitro compounds of toluene, xylene and naphthalene resides in the fact that it contains a lower percentage of carbon and a higher percentage of oxygen. The benzene molecule contains only six carbon atoms while toluene contains seven, xylene contains eight and naphthalene contains ten.

I claim:

A propellant powder consisting of nitrocellulose, trinitrotoluene 5 to 15 per cent and mononitrobenzene 2 to 10 per cent.

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