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

This invention relates to a nitrocellulose base propellant having increased strength characteristics.

In the solid propellant art it is understood that a single base nitrocellulose propellant is one having a composition of mainly nitrocellulose with small percentages by weight of potassium sulfate, diphenylamine or the like added. Single base nitrocellulose propellants of this type are used extensively with small caliber caseless round ammunition, such as the 7.62 mm. round for example. When used with a 7.62 mm. round a binder was combined with the nitrocellulose propellant and the mixture molded to form the desired shape round. The binder commonly used was collodion which is a 5% nitrocellulose of 7–10% nitrogen content, the balance being a 50–50 mixture of ethanol and ethyl ether. A 7.62 mm. round with this propellant-binder combination produced adequate results when used with a non-automatic weapon. However, when this particular type round was applied to use with an automatic weapon it was found inadequate in that the course of repetitive firing of the weapon rounds would regularly break resulting in the jamming of the weapon bolt. In other words, the rounds are not strong enough for use in an automatic weapon.

In order to obtain a 7.62 mm. round which has sufficient strength to be used in an automatic weapon more bindollion binder could be added to the propellant. However, this approach is not without disadvantage. The collodion, or any other suitable binder for that matter, possesses a lower energy content than the propellant as well as a slower burning rate. Adding too much binder will result in diminishing ballistic characteristics of the round with negligible increases in strength.

It is therefore an object of this invention to provide a single base nitrocellulose propellant having high strength characteristics and which is capable of being used with small caliber caseless rounds of ammunition for use in an automatic weapon. A further object of this invention is to provide a single base nitrocellulose propellant having high strength characteristics without any diminution of ballistic characteristics when used with a small caliber caseless round of ammunition.

In accordance with this invention, these and other objects are accomplished, generally speaking, by dispersing a binder mixture comprised of collodion and acetone in a single base nitrocellulose powder. The propellant-binder combination is then molded into a desired shape, machine, primed, sealed and bulletted to form a caseless round of ammunition. The binder mixture is comprised of approximately 10% by volume of acetone and 90% by volume of collodion. The binder and propellant are added together incrementally into a desired mold until approximately 54.0 grains of propellant to two milliliters of binder are used. The mold is then pressed at 3700 p.s.i. for about 15 seconds. The molded propellant is then heated at 50°C for approximately 16 hours for removing the solvents.

The improved propellant of this invention was molded into a 7.62 mm. round by following the above procedure and samples tested with standard shear, tensile and compression strength testing machines. Like strength tests were conducted on samples which used single base nitrocellulose with collodion binders. Velocity comparisons were also made between like samples. Both samples were approximately 1.65 inches long having a base diameter of 0.470 inch and a bore of about 3/8 of an inch in diameter by about 1/16 inches in length. The bullet used with both samples was a standard M–62 bullet. The data obtained from both the strength and velocity tests is given in the table set forth below.

<table>
<thead>
<tr>
<th>Binder</th>
<th>Shear Strength (pounds)</th>
<th>Tensile Strength (pounds)</th>
<th>Compression Strength (pounds)</th>
<th>Velocity at 78 fl. (p.s.i.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collodion</td>
<td>155</td>
<td>49</td>
<td>117</td>
<td>2,488</td>
</tr>
<tr>
<td>Collodion-acetone</td>
<td>155</td>
<td>49</td>
<td>117</td>
<td>2,488</td>
</tr>
</tbody>
</table>

1 Average value of nine tests.

As is clearly indicated by this data the inventive propellant samples display strength characteristics of a magnitude over three times greater than that of the propellant samples using a collodion binder. The velocities of the comparative samples are virtually the same, the deviation between them being well within the standard deviation allowable with a 7.62 mm. round of ammunition.

It is obvious that many modifications and variations of the present invention are possible in 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.

We claim:

1. A high strength solid propellant consisting of a single base nitrocellulose propellant and a binder mixture in an amount of approximately 1.0 milliliter of binder mixture for approximately 27.0 grains of propellant, said binder mixture comprising about 10% by volume of acetone and about 90% by volume of a low nitrogen nitrocellulose wherein said nitrogen is present within the range of 7 to 10% by weight, the balance being a 50–50 volume mixture of ethanal and ethyl ether.

2. A method for improving the strength characteristics of a single base nitrocellulose solid propellant, which comprises dispersing in said propellant a binder mixture in an amount of approximately 1.0 milliliter for approximately 27.0 grains of propellant, said binder mixture comprising about 10% by volume of acetone and about 90% by volume of a low nitrogen nitrocellulose wherein said nitrogen is present within the range of 7 to 10% by weight the balance being a 50–50 volume mixture of ethanal and ethyl ether.

No references cited.

BENJAMIN R. PADGETT, Primary Examiner.