

# UNITED STATES PATENT OFFICE

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## AMMUNITION PRIMER COMPOSITION

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This invention relates to priming compositions for ammunition, and particularly to means for improving the stability and handling of priming mixtures, containing lead styphnate and guanylnitrosaminoguanilyltetracene.

The conventional ammunition priming mixture contains a reaction-initiating explosive, a fuel and an oxidizer. In some instances it is necessary to supplement the explosive by a suitable sensitizer such as, for example, guanylnitrosaminoguanilyltetracene. A frictionator, such as ground glass, to assist in the ignition of the composition as it is struck by a blow, is also used where necessary or desirable.

One type of priming mixture contains a reaction-initiating explosive, such as lead styphnate, a fuel such as antimony sulphide, calcium silicide or lead sulphocyanate, and an oxidizer, such as barium nitrate, lead nitrate or lead peroxide, or combinations thereof.

Priming mixtures of this general type, containing lead styphnate, require a sensitizer, and guanylnitrosaminoguanilyltetracene (tetracene) may be used for this purpose.

Examples of such priming mixtures are contained in the patents to Rathsburg, Reissue 17,540; Von Herz, 1,889,116; and Burns, 1,905,795.

Mixtures containing calcium silicide, when loaded into shells in a wet pasty form, harden in storage, and the hardened mixture does not function properly. The calcium silicide causes the difficulty because, when wet, the calcium carbide forms lime and acetylene.

Many of the lead styphnate-guanylnitrosaminoguanilyltetracene priming mixtures are particularly adversely affected when stored in a hot, moist atmosphere. This was especially found to be true when loaded with certain powders, such as double base powders containing more than 10% nitroglycerin, the balance of the powder being mostly nitrocellulose.

It was desirable, therefore, that means be found to eliminate the wet hardening of certain of the priming mixtures and to decrease the loss of stability and loss of sensitivity of the priming mixtures, especially when in combination with a double base nitroglycerine powder. In the conventional rimfire shell the primer and powder are in contact and are closely confined in the same cavity of the shell. The invention is not limited to rimfire shells but is applicable to center fire and shot shells and any other use where the stability is adversely affected.

One of the objects of the present invention is

to improve the stability and to eliminate the wet hardening of the guanylnitrosaminoguanilyltetracene and lead styphnate priming mixtures. Other objects of the invention will become apparent to those skilled in the art when the following description is read.

By this invention it has been found that the addition of trinitrophenols, such as trinitroresorcin, trinitro m-cresol and picric acid, will impart to the priming mixtures, about to be described, the desired properties.

The ingredients of a priming mixture including calcium silicide, may be mixed together in dry form and then the explosive ingredients added in wet form.

Trinitroresorcin, which has been added to prevent the wet hardening of a mixture containing calcium silicide, apparently reacts with the calcium silicide with an evolution of heat, which might result in a dangerous condition arising in the priming composition during mixing. This may be prevented by washing the calcium silicide with an acid before the calcium silicide is placed into the mixture. If desired trinitroresorcin may be used as the acid, and if sufficient trinitroresorcin remain in the washed calcium silicide, the trinitroresorcin may be placed in the priming mixture in this manner.

Examples of the use of a trinitrophenol as a means for the prevention of wet hardening of a guanylnitrosaminoguanilyltetracene - styphnate priming mixture are:

	Ex. I	Ex. II
	<i>Per cent</i>	<i>Per cent</i>
Guanylnitrosaminoguanilyltetracene.....	2	2
Lead styphnate.....	25	38
Barium nitrate.....	42	39
Lead peroxide.....	10	5
Antimony sulphide.....	6	5
Calcium silicide.....	12-13	8-9
Trinitroresorcin.....	3-2	3-2

The addition of trinitroresorcin to this priming mixture eliminated the wet hardening or setting up of the mixture, which developed in a mixture having the composition:

### Example III

	Per cent
Guanylnitrosaminoguanilyltetracene.....	2
Lead styphnate.....	25
Barium nitrate.....	42
Lead peroxide.....	10
Antimony sulphide.....	6
Calcium silicide.....	15

The primers made with the last mentioned mixture hardened and did not function properly in cartridges because hangfires developed when kept wet for several days.

Examples of priming mixtures, which it is desired to use and particularly in conjunction with certain double base powders, are

	Ex. IV	Ex. V
	Parts	Parts
Guanylnitrosaminoguanyltetracene.....	2	4
Lead styphnate.....	40	38
Lead nitrate.....	30	25
Lead sulphocyanate.....	8	8
Glass.....	20	25
Trinitroresorcin.....	1	1

These mixtures were primed into the conventional 22 rimfire shells and loaded with double base nitroglycerine powder, and were subjected to high humidity and elevated temperature conditions over a period of time. They were fired at regular intervals, and the barrel time was taken. Barrel time is the time elapsing between the blow of the firing pin and emergence of the bullet from the muzzle of the gun, and gives an indication of the deterioration or instability of the cartridge.

Samples, with and without trinitroresorcin, were subjected to this test, and a very marked superiority was shown by the sample containing trinitroresorcin. There were numerous misfires of the shells without trinitroresorcin, and there were no misfires with the shells containing the priming mixture having trinitroresorcin therein.

An example of one of these tests is as follows:

*Barrel time in seconds*

Ex. III without trinitroresorcin	Ex. III
0.00445	0.00378
0.01000	0.00378
misfire	0.00445
0.00414	0.00382
misfire	0.00388
0.00342	0.00379
0.00630	0.00460
0.00432	0.00405
misfire	0.00353
0.00326	0.00371
Av. 0.00513	Av. 0.00390
Max. 0.01000	Max. 0.00460
Min. 0.00326	Min. 0.00353
Var. 0.00674	Var. 0.00117

Another example of a use of trinitroresorcin in a priming mixture is:

*Example VI*

	Parts
Guanylnitrosaminoguanyltetracene.....	3
Lead styphnate.....	27
Lead nitrate.....	40
Antimony sulphide.....	14
Calcium silicide.....	7
Lead sulphocyanate.....	9
Trinitroresorcin.....	1

The exact reason for this effect is not known. It might be that the guanylnitrosaminoguanyltetracene is protected from destruction, or that

there is an anti-oxidant action present. There is also a possibility that the copper present in many of the shells serves as a catalyst and that the trinitrophenols counteract its action, but this is not definitely known. It is known that guanylnitrosaminoguanyltetracene and lead sulphocyanate disappear from ammunition which has been stored for a long time.

The priming mixture is apparently protected against the action of the fumes of a powder, such as a double base powder, when it is closely confined therewith. This is of particular importance as by this invention it is possible to use a wider combination of primers and powders in ammunition.

In the foregoing description, the use of certain stabilizers and handling-improving agents has been described, in conjunction with priming mixtures having certain ingredients therein, but it is to be distinctly understood that the invention is not limited thereto, nor to the proportions given, except as set forth in the appended claims.

It is also to be understood that the reference to "rimfire shells" or "shells" is merely an illustration of the use of the invention, and that the invention is applicable to the mixtures described regardless of their use, and is equally advantageous in the filling of rimfire or shot shell primers or anywhere the material is handled.

It is quite evident that the quantities of the different ingredients of the priming mixtures, or equivalent ingredients, may be used and that by this invention a way has been found to successfully stabilize the priming mixtures disclosed, and to stabilize them in conjunction with certain powders in shells, and that therefore the appended claims are to be broadly construed.

What is claimed is:

1. An ammunition priming composition comprising tetracene and a small quantity of trinitroresorcin.

2. An ammunition priming composition comprising tetracene, lead styphnate, and a small quantity of trinitroresorcin.

3. An ammunition priming composition comprising tetracene, lead styphnate, and a small quantity of a trinitrophenol.

4. An ammunition priming composition comprising tetracene, lead styphnate, calcium silicide, and a small quantity of trinitroresorcin.

5. In the preparation of ammunition priming compositions containing calcium silicide and trinitroresorcin, the method which comprises the washing of the calcium silicide with trinitroresorcin prior to admixture with the other ingredients, and the subsequent admixture of calcium silicide moistened with trinitroresorcin with the other ingredients.

6. In the preparation of ammunition priming compositions containing tetracene, calcium silicide and trinitroresorcin, the method which comprises the washing of the calcium silicide with trinitroresorcin prior to admixture with the other ingredients, and the subsequent admixture of calcium silicide moistened with trinitroresorcin with the other ingredients.

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