

UNITED STATES PATENT OFFICE

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PRIMING COMPOSITION

No Drawing. Application filed February 20, 1930, Serial No. 430,138, and in Great Britain March 3, 1929.

This invention relates to priming compositions for ammunition and particularly to the class of priming compositions which are non-corrosive, that is, which do not leave in the bore of the firearm a residue which upon subsequent exposure to a humid atmosphere causes corrosion. The present application is a continuation-in-part of our co-pending application Serial No. 352,893, filed April 5, 1929.

The function of a priming composition in a cartridge is to provide a flame of sufficient intensity of heat to effectively ignite the propellant powder, the priming composition itself being ignited by the blow of the firing pin upon the priming mixture container. Until comparatively recently substantially all commercially successful priming compositions have included, as their chief ingredients, mercury fulminate, potassium chlorate, and a fuel to be burned with the oxygen liberated from the potassium chlorate; the principal fuels being antimony sulphide and/or lead sulphocyanate. Mercury fulminate alone does not function well as a primer for the reason that it explodes with too great violence when struck a blow, and produces very little flame and heat. Its function in priming compositions is to initiate a reaction between the oxidizer and the fuel, such reaction furnishing the hot flame of substantial length and duration which ignites the powder.

Both mercury fulminate and potassium chlorate are objectionable in priming mixtures. The potassium chlorate breaks down into a highly hygroscopic potassium chloride, which is the agent responsible for after corrosion. It has been found possible, by a careful selection and accurate proportion of ingredients, to replace potassium chlorate with certain other oxidizers which do not leave corrosive residues. Mercury fulminate, however, has remained a standard sensitizer or combustion initiator for practically all ammunition primers. It is objectionable not only by reason of its high and increasing cost but also on account of its highly poisonous character with the consequent dangers to health, particularly the health of

the workmen engaged in handling, mixing and loading it into cartridge shells and primer cups. Furthermore, mercury fulminate tends to react with many materials which otherwise are desirable primer mixture ingredients, thus greatly limiting the number of available oxidizers and fuels. It also amalgamates readily with many metals, such as the zinc in brass, necessitating the use of expensive copper or nickel plated primer cups. The elimination of dangerous, poisonous and troublesome mercury fulminate has, for these reasons, been the ideal of ammunition manufacturers for a great many years.

In the United States Patent No. 1,443,328 to Edmund von Herz there is described the production of the normal lead salt of styphnic acid, commonly called lead trinitroresorcinate; and the use of this substance generally as a priming mixture ingredient. Experiment and test have indicated the desirability of a sensitizer in such mixtures, and the pending application of J. E. Burns, Serial No. 177,848, filed March 23, 1927, discloses mixtures including lead trinitroresorcinate with substantial amounts of mercury fulminate. In these prior disclosures, however, as well as in all prior primer mixtures of any kind, the sensitizing ingredient has been present in such proportions as to constitute a substantial fraction of the entire mixture.

The present invention comprises the discovery of a highly successful combination of ingredients by the use of which both mercury fulminate and corrosive oxidizers are rendered unnecessary, and the further discovery that the sensitizing function of mercury fulminate is effectively performed by an extremely small quantity of another sensitizer which does not have the disadvantages of mercury fulminate.

The sensitizing agent utilized in the present invention is selected from the class of compounds known as tetracenes, said compounds being described in the British patent to Rathsburg, No. 201,009 of June 30, 1922.

In said co-pending application, Serial No. 352,893, filed April 5, 1929, we have disclosed our discovery that a tetracene, for

example guanylnitrosaminoguanyltetracene ($C_2H_8ON_{10}$), possesses such value as a sensitizer for priming mixtures that it may be used in extremely small quantities, even to the surprisingly small amount of .5 of one per cent. In connection with the furtherance of our experiments it has been found that the small amount of 0.5% of guanylnitrosaminoguanyltetracene is in sensitizing effect equivalent to that of a very much larger amount of mercury fulminate. More specifically, 0.5% of guanylnitrosaminoguanyltetracene has been found to produce the same result as about 18% of mercury fulminate and 1% of guanylnitrosaminoguanyltetracene has been found substantially equivalent to 30% of mercury fulminate.

While 0.5% is a sufficient quantity of guanylnitrosaminoguanyltetracene to secure proper ignition of most powders, it is desirable in preparing large quantities of priming mixture to use a somewhat greater amount. This is done to insure that every part of the batch will contain a minimum of 0.5%. In commercial practice priming mixture is prepared in lots of 5 to 10 pounds while the individual charge for each cartridge is from .25 grain to about 1 grain. Obviously, it is very difficult to secure such a perfectly uniform distribution of an ingredient present in the amount of only one-half of 1% that each individual charge would contain no less than this amount, and the difficulty is augmented by the light, fluffy, voluminous character of guanylnitrosaminoguanyltetracene. For this reason, in actual practice 1.5% or 2% or for special types of mixtures as much as 4% is ordinarily used. 0.5% has been definitely determined as the minimum which will consistently effect satisfactory priming.

The other ingredients of the mixture may include lead trinitroresorcinate, one or more non-corrosive oxidizers, such as barium nitrate and/or lead peroxide, and one or more fuels, preferably of a hard and gritty nature, such as antimony sulphide and/or calcium silicide.

A typically successful mixture is as follows:

	Per cent
Guanylnitrosaminoguanyltetracene.....	0.5-15
Lead trinitroresorcinate.....	20-45
Barium nitrate.....	30-50
Antimony sulphide and/or other fuel, as for example, calcium silicide.....	10-30
Another successful mixture is as follows:	
	Per cent
Guanylnitrosaminoguanyltetracene.....	0.5-2
Lead trinitroresorcinate.....	35-40
Barium nitrate.....	35-42
Lead peroxide.....	7-12
Antimony sulphide.....	0-5
Calcium silicide.....	6-12
Glass.....	0-3

It will be noted that each of the above for-

mulas includes guanylnitrosaminoguanyltetracene in an extremely small amount, these percentages of guanylnitrosaminoguanyltetracene as above stated being equivalent in their effects to 18% to 30% of mercury fulminate. This discovery is rendered even more remarkable by the fact that the sensitiveness of guanylnitrosaminoguanyltetracene to shock and friction is substantially the same as that of mercury fulminate. Their sensitiveness is so near the same that there is a difference of opinion as to which is really the more sensitive. The present invention is believed to comprise the first discovery of a priming mixture in which a fundamental and essential ingredient is present in an amount of the general order of 1%, and for this reason, the appended claims are to be broadly construed.

What is claimed is:

1. A priming mixture containing guanylnitrosaminoguanyltetracene in an amount not greater than 4%.

2. A priming mixture containing between 0.5% and 4% guanylnitrosaminoguanyltetracene.

3. A priming mixture containing a non-corrosive oxidizer, a fuel, and not more than 4% of guanylnitrosaminoguanyltetracene.

4. A priming mixture containing lead trinitroresorcinate, and 0.5% to 4% of guanylnitrosaminoguanyltetracene.

5. A priming mixture containing lead trinitroresorcinate, a non-corrosive oxidizer, a fuel, and not more than 4% of guanylnitrosaminoguanyltetracene.

6. A priming mixture containing lead trinitroresorcinate, barium nitrate, antimony sulphide, and not more than 4% of guanylnitrosaminoguanyltetracene.

7. A priming mixture containing lead trinitroresorcinate, a non-corrosive oxidizer, antimony sulphide, calcium silicide, and not more than 4% of guanylnitrosaminoguanyltetracene.

8. A priming mixture containing lead trinitroresorcinate, barium nitrate, antimony sulphide, calcium silicide, and not more than 4% of guanylnitrosaminoguanyltetracene.

9. A priming mixture containing approximately:

	Per cent
Guanylnitrosaminoguanyltetracene.....	0.5-2
Lead trinitroresorcinate.....	35-40
Barium nitrate.....	35-42
Lead peroxide.....	7-12
Antimony sulphide.....	0-5
Calcium silicide.....	6-12
Glass.....	0-3

10. A priming mixture containing barium nitrate, lead peroxide, antimony sulphide, calcium silicide, and a quantity of guanylnitrosaminoguanyltetracene not greater than 4%.

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