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PRIMING COMPOSITIONS

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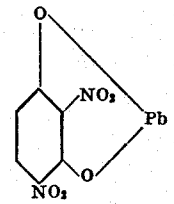
The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to its of any royalty thereon.

This invention relates to priming compositions for propellent powders and other explosives, and more particularly the use of normal lead dinitroresorcinate as the essential constituent of the priming compositions.

The term priming composition commonly refers and refers herein to an explosive composition used to effect ignition of a propellent powder or other explosive. It is the function of a priming composition to deliver intensely hot, flaming gases when combustion of the composition is initiated by the impact or stab of a firing pin or other firing device. It is not required that the composition detonate or produce highly brisant effects; in fact such effects are definitely avoided by the common methods of formulating priming compositions. Thus the sensitive, highly brisant explosives such as mercury fulminate, lead azide, lead styphnate, and hexanitromannite have never been used alone as priming compositions but it has been general practice to employ such so-called detonating agents in admixture with other materials which will reduce the brisant effect of the detonating agent and provide a sensitive priming mixture which will burn rather than detonate under the conditions of use. Apparently only one other type of priming compositions has been used viz. a mixture of oxidizing agents, fuels and sensitizing agents none of which alone are explosive, or at least capable of detonating, but which when mixed become sensitive to ignition and burn rapidly with intense heat effects.

There is a fundamental objection to the two types of priming mixtures referred to which have been used up to the present time in that it is extremely difficult to provide the intimate mixing of ingredients necessary to obtain the degree of uniformity desired. When it is considered that many primers are expected to fire from the stab of a sharp pointed firing pin which contacts only a very small part of the primer charge, which is present itself in only minute amount it is apparent that the maximum uniformity in composition is required if the primers are to function uniformly. Yet as mentioned above the compositions in general use at present almost invariably contain three or four non-explosive constituents such as ground glass, antimony sulphide, calcium silicide, barium nitrate, etc., having widely different specific gravity, hardness, crystal form and other physical characteristics which make a truly homogeneous blend very difficult to obtain. The lack of homogeneity which often results in the firing pin contacting only crystals or particles of the non-explosive constituents of the priming mixture, is one of the main causes of ignition failures or ignition delays.

It has been considered that a marked improvement in the uniformity of behavoir of primer compositions would be obtained if compositions could be formulated so as to contain only explosive constituents. It was believed that if all non-explosive oxidizing agents, fuels, and abrasives or sensitizers could be eliminated and only sensitive explosives used, the difficulty of attaining the highest degree of homogeneity would be eliminated; if all particles of the composition were sensitive explosives any particle struck by the firing pin would readily ignite. An extension of this idea led to the belief that the ideal would be attained if an explosive could be found which, alone, would provide all the characteristics required of a primer composition, i. e. the high degree of sensitivity to impact, the rapid rate of burning, the inability to detonate under the conditions of use, etc. We have discovered that normal lead dinitroresorcinate has combined in itself all the properties required for certain uses of a priming composition which must function under a stab or flame action. It is sufficiently sensitive to impact or flame that it ignites under the conditions available in ammunition, it burns rapidly without producing objectionable brisant or blast effects comparing closely with standard military primer compositions in this respect. It is insoluble in water, does not absorb moisture from the air, and leaves no objectionable residue in the bores of guns. Since it alone provides these characteristics its use eliminates the hazard of mixing, always present in the manufacture of previous types of primer compositions. The chemical formula for normal lead dinitroresorcinate is as follows:



It may be prepared by the action of a lead salt such as lead nitrate on sodium dinitroresorcinate.

Since primers are used in many different types

of ammunition components such as military fuzes, small arms cartridges, etc., it was recognized that the lead dinitroresorcinate might not serve all of these different purposes with the same degree of efficiency and an effort was made to modify its speed of action and sensitivity by employing it in mixture with other materials. It was found that such mixtures can be prepared which vary markedly in brisant effects without losing the degree of sensitivity required for consistent functioning. Compositions comprising the lead dinitroresorcinate in admixture with finely divided black powder, in admixture with tetracene and in admixture with nitrocellulose have been found to function efficiently and with various speeds of action and with the production of an increased volume of gaseous products. A comparison of the behavoir of the new compositions containing lead dinitroresorcinate, with a composition of the type in general use at present is shown in the following table:

	Composition		Sensitivity	Impulse	Gas volume
		Percent			*Cc.*
1	Lead dinitroresorcinate	100	2.5″	1.9″	4.4
2	Lead dinitroresorcinate	75	3.5″	3.03″	6.4
	Black powder	25			
3	Lead dinitroresorcinate	75	3.0″	2.12″	4.50
	Tetracene	25			
4	Mercury fulminate	34	4.0″	1.8″	3.25
	Potassium chlorate	14			
	Antimony sulphide	21			
	Ground glass	31			

To facilitate loading, 2% of shellac in alcohol solution was added to moisten and bind the compositions.

Composition No. 4 is listed above as representative of the type in use at present and for comparison with the new compositions developed. It is noted that composition No. 1 comprising lead dinitroresorcinate alone has even a higher degree of sensitivity than composition No. 4 substantially the same impulse value or brisant effect and a higher gas volume, while compositions 2 and 3 are intermediate in sensitivity between compositions 1 and 4 and have appreciably higher impulse and gas volume values than composition No. 4. It is thus indicated that the new compositions cited do not merely duplicate but are superior to the present type of composition No. 4 in both sensitivity and gas volume. In addition these new compositions are entirely free of ground glass, antimony sulphide or any other non-explosive material a particle of which may be contacted directly by a firing pin and thus lead to failure of the primer to ignite. An additional outstanding advantage of these compositions results from the resistance of lead dinitroresorcinate to decomposition. It has been found to have stability far superior to mercury fulminate and other sensitive explosives commonly used in primer compositions.

In general, any dinitro compound is much less sensitive than a trinitro compound and for this reason the latter type of compound is usually found in primer compositions. However we discovered that lead dinitroresorcinate is even more sensitive than the trinitroresorcinol or the lead salt of trinitroresorcinol while having only approximately one-sixth the brisance. Accordingly it is more suitable for use in priming compositions where initiation is effected by the stab of a firing pin.

We claim:

A priming consisting of normal lead dinitroresorcinate.

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