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PRIMING COMPOSITION

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This invention relates generally to priming compositions, and particularly to such compositions as are especially adapted for use in cartridges of the rim fire type.

In charging the priming composition into cartridges, such as for instance the rim fire type, it is the customary practice to prepare pellets of suitable size from a damp mixture of the ingredients and then to spin or throw the pellets thus formed into position within the primer cavity of the cartridge. In view of the fact that high speed spinning tools are generally employed for depositing the mixture in position, it is apparent that such operations are sufficiently violent that explosions of the priming mixture are liable to occur. In order to lessen the danger of such explosions, it is customary to charge the composition into the cartridges while the moisture content is sufficiently great to prevent premature explosion or ignition thereof. In order to secure sufficient cohesion of the ingredients to form a pellet which can be spun while damp and also to provide a sufficiently hard and non-crumbly mass when dried in position in the cartridge case, it is customary to employ a binding agent, such as for instance gum arabic, which is incorporated in the priming mixture and operates as well to cause the dry composition to adhere to the metallic case. There are many objections to the use of gum arabic in such compositions however, among which is the fact that it is hygroscopic rather than moisture proofing and accordingly compositions containing gum arabic frequently become desensitized due to moisture absorbed thereby and the consequent chemical deterioration which is promoted by the presence of moisture. Furthermore under conditions of warm temperatures and moisture gum arabic has a tendency to ferment thus giving rise to an acidic substance which accelerates the chemical deterioration of the priming composition. It is among the objects of the present invention to provide a priming composition particularly adapted for rim fire cartridges in which a binder is employed which will overcome the objectionable features of gum arabic.

Another object of this invention generally stated is to provide a priming composition in which is incorporated a non-hygroscopic binder.

A further object of this invention is to provide a priming composition particularly adapted for rim fire cartridges and containing a binder capable of forming a rigid mass upon drying.

A further object of this invention is to provide a priming composition particularly adapted for use in rim fire cartridges and in which the binder employed is capable of drying without shrinkage.

Another object of the invention is to provide a priming composition particularly adapted for rim fire cartridges and in which a binding substance is employed for causing the mass of priming composition to adhere to the walls of the metallic cartridge case.

Further objects will become apparent to those skilled in the art when the following description is read. It is to be understood, however, that the invention is not limited to the specific embodiments which are hereinafter described for the purpose of illustration, but that the essential features of the present invention are applicable to priming mixtures generally.

In accordance with the present invention which particularly pertains to rim fire priming composition and for the purpose of illustration will be described with reference thereto, the usual initiating, oxidizing, and fuel ingredients of priming compositions may be mixed while wet and incorporated with a binder preferably having non-hygroscopic characteristics. The particular binding material which is selected will, of course, depend upon the circumstances of use, but advantageous results have been attained with any one of the soluble cellulose acetates, other esters of cellulose and certain gums and resins, specific examples of which will be given hereinafter, but which may generally be characterized as relatively insoluble in water. In selecting a binder for use in connection with the present invention it is important that one should be selected in which upon drying no noticeable shrinkage of the composition will occur. When shrinkage of the composition during drying is thus avoided, the presence of air cavities in the region of the priming mixture is avoided and a harder, more rigid mass is attainable. The binder selected should, of course, be capable of producing substantially a rigid, hard mass in order that the sensitivity of the cartridge will be such as to insure firing. Furthermore, it is important that the binding material operate to produce a tenacious film between the composition and the metallic wall of the cartridge case, and it is apparent that such a film operates not only to cause the composition to adhere to the case, but also protects the composition or any ingredients thereof from reaction with the metal of the case.

Of the various binding materials which are susceptible of use in accordance with the present invention ester gum and cellulose acetate are par-

ticularly adaptable and this is especially true when the priming mixture contains lead azide as an initiating ingredient. The use of ester gum, cellulose acetate or the like as a binding material for priming compositions containing lead azide makes possible the use of the process described and claimed in the copending application, Serial No. 595,418, filed February 26, 1932, in which the priming compositions are maintained moist during the charging operations by material having a relatively low volatility as compared to water, an example of which is dichlorethyl ether. Ester gum is soluble in dichlorethyl ether and cellulose acetate is soluble in a mixture containing a large proportion of dichlorethyl ether, to be referred to hereinafter, and, therefore, lend themselves particularly for use in the process mentioned in the copending application. However, there exists a wide range of cellulose acetates, and it is important to select the most suitable for use with the particular solvent which it is desired to employ, the selection, of course, depending upon the degree of shortness and tackiness which it is desired that the composition should possess during the charging and spinning operations.

As a specific example of a binding agent suitable for use with a priming composition containing lead azide as an initiator; a 10% solution of cellulose acetate, having an acetyl content of approximately 38% and a viscosity of 50° Saybolt may be incorporated with a suitable solvent, such as one comprising ten parts by weight of "cellosolve" (ethylene glycol monoethyl ether) and ninety parts by weight of dichlorethyl ether. Such a binding agent may be incorporated with the ingredients of the priming composition at any time during the mixture thereof, and may be charged into the priming cavity of the cartridge case using the usual spinning machines. After thus charging the cartridge cases the composition may be permitted to dry for a sufficient time to volatilize the solvent employed and permit the binder to form a rigid, desirably hard mass, tenaciously adhering to the walls of the cartridge case.

Advantageous results may be attained by employing with the binder above described a small quantity of a gummy or resinous material, such as for instance ester gum, Canada balsam and the like, alone or in combination with plasticizers for cellulose acetate. Gums of the ester gum, Canada balsam type, operate as deflocculating agents and thus maintain the finely divided lead azide in dispersion so as to render handling thereof more safe. Under certain conditions some of the advantages of the binding composition referred to above may be attained with the use of the solvent mixture above referred to containing the gummy or resinous material but omitting the cellulose acetate.

In certain cases it is desirable to add active fuels, generally of the high explosive type, which are miscible with the main binding material and which form solid solutions in or with such binders. For example, 20 to 30 parts tetryl and 80 to 70 parts of ester gum forms a desirably hard binder of greater inflammability than the ester gum alone. A greater quantity of the tetryl may be added without appreciably disturbing the binding properties of the mixture as the excess will be present as a crystalline solid. As specific illustrative examples of primer compositions including ester gum as the waterproofing binder with or without tetryl, the following illustrative formula may be followed:

Lead azide	26½	26½	24½
Powdered glass	25	25	26
Aluminum	6	8½	8
Tetryl	5		
Barium nitrate	35	35	39
Ester gum	2½	2½	2½
TNT		2½	

Under some conditions it is desirable to incorporate with the binder, and particularly when cellulose acetate is used as the binder, a suitable plasticizer therefor. The incorporation of a suitable plasticizer particularly facilitates the handling of the composition and contributes particularly to the waterproofing effect of the cellulose acetate. As specific illustrative examples of such a primer composition including cellulose acetate and a suitable plasticizer therefor, are the following:

Lead azide	25	25	20
Powdered glass	25	25	20
Flake aluminum	8	7	6
Barium nitrate	38½	38	35
TNT		2½	2½
Cellulose acetate	2½	2½	2½
Ethyl-meta-toluene sulfonamide	1		1

From the foregoing description it is apparent that such binding agents as those hereinbefore referred to will when employed with the priming compositions hereinbefore mentioned for the purpose of illustration, or with any well known priming composition whether of the azide or fulminate type, produce upon removal of the solvent employed, a hard mass of priming composition adhering tenaciously to the walls of the cartridge case. The degree of adherence to the cartridge case is of particular importance since it must be sufficiently great that the priming composition can not be loosened from the shell by relatively severe jarring and the mass must be sufficiently rigid when fired that it responds readily to the shock of a firing pin. It is apparent that a soft crumbly mass of priming composition will be neither as dependable, nor as sensitive as the same composition in a rigid mass strongly adhering to the walls of a cartridge case, and it is apparent, therefore, that any well known primer composition containing a binder selected in accordance with the present invention will be characterized by advantageous properties for which the binder may in whole or in part be responsible. This is especially true since binding materials selected in accordance with the present invention are adapted to waterproof the composition and thus prevent deterioration thereof. The presence of non-hygroscopic binding agents in a priming composition operates to prevent interaction of the various ingredients as well as changes in the chemical characteristics thereof due to hydrolysis. Furthermore such binding agents as ester gum, cellulose acetate and other cellulose esters operate as a deterrent so that the violence or brisance of the more violent agents is reduced and accordingly defects and hazards heretofore experienced in the use of violent initiating agents are avoided.

From the foregoing description it is apparent that many modifications of the priming compositions and binders hereinbefore referred to for the purpose of illustration will present themselves to those skilled in the art without departing from the spirit of this invention. It is to be distinctly understood, therefore, that the invention is not limited to the use of any particular embodiment

hereinbefore referred to for the purpose of illustration. It is to be understood, therefore, that such modifications and the use of such individual features and sub-combinations of features as do not depart from the spirit of this invention are, although not specifically described herein, contemplated by and within the scope of the appended claims.

Having thus described the invention, what is claimed is:

1. A priming mixture comprising, a highly sensitive ingredient of the lead azide type in finely divided form, and a binder containing a deterrent substance of the class consisting of ester gum, cellulose acetate and Canada balsam.

2. A priming mixture comprising, a highly sensitive ingredient of the lead azide type in finely divided form, and a binder containing ester gum.

3. A priming mixture comprising, a highly sensitive ingredient of the lead azide type in finely divided form, and cellulose acetate as a binding ingredient.

4. A priming mixture comprising, a highly sensitive ingredient of the lead azide type in finely divided form, and a binder containing Canada balsam.

5. A priming mixture comprising, a highly sensitive ingredient of the lead azide type in finely divided form, and a binder composed of a water resistant cellulose ester having a deterrent action upon the highly sensitive ingredient and a gum of the ester gum—Canada balsam type.

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