ABSTRACT OF THE DISCLOSURE

A primer composition for solid propellant charges comprising a mixture of nitrocellulose and 5–80% by weight, preferably 5–50%, of a percussion-sensitive diazo, triazole or tetrazole derivative, for example, 5-aminoetrazole, diazodinitrophenol or tetrazene. Up to about 40% by weight of nitro compounds, such as pentrite and nitromannite, can be added to vary and improve the brisance of the mixture of the primer. The composition finds particular use in the recess of annular caseless propellant cartridges, for example, in stud driving tools.

BACKGROUND OF THE INVENTION

This invention relates to primer compositions for solid propellant charges. More particularly, it relates to percussion-sensitive primer compositions for solid propellant charges comprising diazo, triazole or tetrazole derivatives. Substances conventionally employed for the ignition of propellant charges are primer mixtures containing primers such as trinitrotoluene (TNT) and tetrazene, known under the name of “Simoxid” and having thermal components mixed therewith, such as calcium silicide and antimony sulfide. These compositions burn with the aid of oxidizers, such as barium nitrate, potassium nitrate, metallic oxides, etc. These primer charges develop a large amount of heat and have a varying percussion sensitivity, depending on the tetrazene content admixed in the mixtures.

These mixtures, during combustion, leave solid components deposited in the barrel and in the cartridge case as lead compounds, metallic oxides and carbon. In certain fields of use, these residues can have a troublesome effect, especially in those cases where a clean surface of the combustion chamber and the barrel is desired after firing.

Troublesome residues are likewise formed when burning percussion-sensitive mixtures of nitrocellulose and metallic components, such as aluminum, magnesium, calcium silicide and lead picrate, although nitrocellulose powder by itself burns without leaving any appreciable residues, as is known in the art.

The objects of the present invention is to provide primer compositions which overcome the disadvantages and the prior art.

Another object of the present invention is to provide primer compositions for solid propellant charges wherein the above-mentioned disadvantages, especially formation of combustion residues, are avoided.

A further object of the invention is to provide percussion-sensitive primer compositions for solid propellant charges which have a stable percussion sensitivity and which do not leave undesirable residues when fired.

These and other objects and advantages of the present invention will become apparent to those skilled in the art from a consideration of the following specification and claims.

SUMMARY OF THE INVENTION

In accordance with the present invention, a primer composition constituted by a mixture of 5–80%, preferably up to about 50%, by weight of a percussion-sensitive diazo, triazole or tetrazole derivative and nitrocellulose has been found to meet the objectives discussed hereinbefore. Preferred diazo triazole or tetrazole derivatives to be employed include, for example, 5-aminoetrazole, diazodinitrophenol or the like, and most preferably, tetrazene.

It has been found that, although, on the one hand, nitrocellulose powder exhibits a relatively low percussion sensitivity and, on the other hand, tetrazene also shows a sufficient sensitivity only with the aid of frictional agents or by the admixture of hard or dense components therewith, such as calcium silicide or glass, an intimate mixture of nitrocellulose with, for example, tetrazene possesses a high percussion sensitivity even without the addition of hard and dense filler materials thereto.

According to a further embodiment of the invention, up to about 40% by weight, based on the total mixture, one or more nitro compounds is added to the mixture. Exemplary nitro compounds include explosive nitrated esters, for example, pentrite (pentanitrophenyl tetranitrate), nitromannite (mannitol hexanitrate) or the like. These additives make it possible to improve or vary, as desired, the brisance of the mixture.

In a further embodiment of the invention, the mixture is granulated in a conventional manner with the aid of solvents, such as acetone, ethyl acetate or methyl acetate and/or colloidal substances, such as glue (mucilage), gelatin of dextrine. By using said colloidal substances, it is possible to impart to the mixture a spherical character so that a better fluidity after drying is obtained.

EXAMPLES OF THE INVENTION

The following examples are given merely as illustrative of the present invention and are not to be considered as limiting. Unless otherwise noted, the percentages therein and throughout the application are by weight.

A granulated mixture, consisting essentially of 50% by weight of tetrazene and 50% by weight of nitrocellulose, results in a percussion sensitivity of 0.03 mKp (meter kilopond) (1 kg. falling weight), in accordance with the BAM falling weight test. The sensitivity of pure nitrocellulose according to this test is about 0.35 mKp, while that of tetrazene is about 0.2 mKp. The tetrazene content in the mixture can be reduced to 5% by weight, and the mixture still exhibits a sensitivity of about 0.2 mKp. Thus, the sensitivity value is still below the sensitivity of pure nitrocellulose.

In comparison thereto, a primer composition mixture of the above-described type wherein the components are mixed with one another mechanically, exhibits under the same conditions, a percussion sensitivity of about 0.1–0.2 mKp.

Thus, in both cases, the percussion sensitivity of the mixture is equal to or better than that of the more percussion-sensitive component.

An amount of 5 mg. of the mixture of 50% by weight of nitrocellulose and 50% by weight of tetrazene is sufficient to ignite, for example, 160 mg. of nitrocellulose powder and to bring about a complete conversion. This ratio can, however, be varied within wide limits in accordance with the arrangement and the geometric relationships.

It should be apparent that the possibilities for the utilization of the primer composition of this invention are very manifold. In particular, the composition of the invention, in accordance with a further embodiment, can be used advantageously in the recess of annular caseless propellant cartridges for stud driving tools, wherein the cartridges are produced from propellants such as nitro-
cellulose or mixtures of nitroglycerin and nitrocellulose. However, it is, of course, also possible to apply or arrange the primer composition on the surface of propellant powder bodies having any other desired shape.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included herein.

We claim:

1. A primer composition for solid propellant charges comprising a mixture of nitrocellulose and about 5 to 80% by weight of a percussion-sensitive compound selected from the group consisting of a diazo, a triazole, and a tetrazole compound.

2. A primer composition according to claim 1, wherein about 5 to 50% by weight of said percussion-sensitive compound is employed in said mixture.

3. A primer composition according to claim 1, wherein said percussion-sensitive compound is selected from the group consisting of 5-aminotetrazole, diazodinitrophenol and tetrazene.

4. A primer composition according to claim 1, wherein said mixture further includes up to about 40% by weight, based on the total mixture, of at least one nitrated ester.

5. A primer composition according to claim 4, wherein said nitrated ester is selected from the group consisting of pentrite and nitromannite.

6. A granulated free-flowing primer composition for solid propellant charges comprising a mixture of nitrocellulose and about 5 to 80% by weight of a percussion-sensitive compound selected from the group consisting of a diazo, a triazole, and a tetrazole compound.

7. A primer composition for solid propellant charges comprising a mixture of nitrocellulose and about 5 to 50% by weight of a percussion-sensitive compound selected from the group consisting of 5-aminotetrazole, diazodinitrophenol and tetrazene.

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