United States Patent Office 2,908,560 Patented Oct. 13, 1959

2,908,560

NON-CAKING WATER-RESISTANT EXPLOSIVE OF THE AMMONIUM NITRATE TYPE

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No Drawing. Application April 13, 1954
Serial No. 422,973

Claims priority, application Germany April 13, 1953

3 Claims. (Cl. 52—14)

The present invention relates to ammonium nitrate type explosives.

It is known that pulverized ammonium nitrate explosives, especially when they contain no blasting oil, exhibit certain fluctuations in their nature, for example hardening and lack of storage resistance in moist air. These explosives must therefore be enveloped and packed in particularly water-tight fashion. Apart from their sensitiveness to water, these explosives are unsuitable for introduction into bore holes in loose form, in the same way as black powder, since the individual grains or conglomerates constituting them having such a bulky and irregular form that they readily cake together. Consequently, it is difficult for them to pass through the long tube of a filling funnel and there is no guarantee that the bore hole containing them is completely filled with explosive, especially if said bore hole is rough and jagged. Apart from this lack of non-caking property, such explosives also cannot be used in wet bore holes by reason of their sensitiveness to moisture. These unfavourable properties of ammonium nitrate explosives can be somewhat improved by the addition of aromatic nitro-compounds and by mixing the components of the explosive in a known manner at such a high temperature that the added aromatic nitro-compounds melt. However, a really good non-caking property, such for example as that of blasting nitrate, in particular for the satisfactory filling of the bore hole, has not hitherto been obtained.

According to the present invention, there is provided a non-caking, pulverized ammonium nitrate type explosive containing ammonium nitrate and a second explosive component, having a high water resistance, and characterized in that materials which are surface-active with respect to one of the components of said explosive and which may themselves be explosives or highly polymeric materials are added to one of the said components forming said explosive.

Aromatic nitro-compounds such as di- and trinitrotoluene are preferably used for the second explosive component. A surface-active additive such as tetryl is added, preferably to the aromatic nitro-compound, before or during the hot working-up into the explosive.

Not only is a better adhesion between the ammonium nitrate and the aromatic nitro-compounds then obtained, but conglomerates are formed with a substantially more favourable form for use as explosives, i.e. the aromatic nitro-compound so arrange the ammonium nitrate crystals and so unite them to form rounded conglomerates under the action of the surface-active material that only a relatively small number of ammonium nitrate crystal faces remain uncovered. Without the said addition, the ammonium nitrate crystals are not so arranged, with the consequence that they protrude from the more rodlet-shaped conglomerates in the manner of prongs. If suitable surface-active materials are chosen, the explosive data are not substantially varied and the explosives exhibit a very good non-caking character, while at the same

time the resistance to moisture is increased. The non-caking property may be further improved in a known manner by a suitable configuration of the crystals and/or by treatment of the surface of the conglomerates with a lubricant.

This process is not limited to ammonium nitrate explosives, but is also applicable to explosives containing other crystalline components and/or other aromatic nitro-compounds.

Example

Two identical explosives are prepared by the same working-up method, these explosives differing only in that in one of them 1% of tetryl is dissolved in the liquid di- and trinitrotoluenes. The explosive has the following composition:

16.0 percent of nitrotoluene
81.7 percent of ammonium nitrate
2.0 percent of wood meal
0.1 percent of argillaceous earth
0.2 percent of dyestuff.

The explosives are mixed at a temperature of 80° C. They have the following properties:

	Ammonium nitrate explosive	
	without addition	with 1% of tetryl
Density	0.92	0.83.
Angle of repose against glass	41° 50′	38° 40′.
Lead block Expansion	381 cc	396 cc.
Transmission of detonation	10 cm	8 cm.
Storage resistance	good	very good.

The explosive containing the tetryl additive is distinguished primarily by a different structure, which is clearly shown by microscopic examination. While the explosive having no tetryl additive consists of angular and sword-shaped particles or conglomerates, in which the ammonium nitrate crystals lie mainly on the surface and the nitrotoluenes more in the interior, the explosive containing the tetryl additive consists of rounded particles in which the nitrotoluenes are situated on the surface and the ammonium nitrate crystals are incorporated within the conglomerate. The smaller angle of repose of the explosive having the additive clearly shows the heightened non-caking property thereof.

We claim:

1. A non-caking, pulverized explosive having a high water-resistance and including a composition comprising 16% of a mixture of di- and tri-nitrotoluene, in any proportions, 81.7% of ammonium nitrate, 2% of wood meal, 0.1% of argillaceous earth, 0.2% of a dyestuff and 1% of tetryl based on said composition.

2. A non-caking explosive composition having a high water-resistance, containing pulverized ammonium nitrate as one of its explosive components, an organic sensitising agent selected from the group consisting of di- and trinitrotoluenes as its other explosive component, and tetryl, in which the tetryl is present in said composition in a proportion of up to 1% by weight based on said composition.

3. An explosive composition according to claim 2, in which at least part of the ammonium nitrate content of said composition is replaced by at least one alkali metal nitrate.

(References on following page)

References Cited in the file of this patent

UNITED STATES PATENTS

1,045,012	Flurscheim	Nov. 19, 1912
1,617,182	Snelling	Feb. 8, 1927
2,001,212	Olsen et al.	May 14, 1935
2,063,572	Woodbury et al.	Dec. 8, 1936
2,353,147	Cook et al.	July 11, 1944
2,680,067	Davidson	June 1, 1954

FOREIGN PATENTS

117,918	Australia	July 6, 1944