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PREVENTION OF CAKING OF CRYSTALS, POWDERS, AND THE LIKE

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This invention comprises improvements in or relating to the prevention of caking of crystals, powders and the like. Many crystals, particularly hydroscopic crystals, and especially when in the form of fine powder, tend to cake together when stored, and it is an object of this invention to eliminate or minimize this tendency. Even non-hygroscopic or water-insoluble crystals may cake in the presence of other vapours than that of water, such as hydrocarbon vapours.

According to the present invention a method of preventing caking in masses of crystals or powders of the kind described consists in intimately incorporating with the said crystals or powders a proportion of fibrous material, for example, asbestos.

This invention further comprises improvements in or relating to explosives of the type in which crystals of an oxygen carrying salt, such as potassium chlorate, ammonium nitrate or the like are employed.

In the manufacture of explosive cartridges from chlorates and the like difficulty is frequently experienced on account of the tendency of the crystals to cake together into a hard mass. Moreover, in the course of exploding such material in a long bore hole or other similar conditions the detonation is not always perfect owing to the quenching effect of the potassium chloride liberated in the combustion of potassium chlorate explosives, which tends to interfere with the combustion of the mass. If a potassium chlorate cartridge (impregnated in the ordinary way with fuel) be ignited without detonation, it will be found that combustion proceeds irregularly and it is thought that a similar action may take place when the cartridge is actually detonated in use. However, this may be, the combustion of such cartridges is not always perfect. It is an object of the present invention to overcome these defects and difficulties.

According to the present invention a cartridge of the kind described contains, intimately distributed through the body of the crystals or powder in the cartridge, a small proportion of a fibrous material.

The preferred fibrous material is asbestos but talc or mica can be employed in admixture with asbestos.

The invention further includes a granular explosive the grains whereof consist of oxygen carrying crystals of the kind described having intimately disseminated through their substances finely divided particles of an inert silicate of the kind set forth. Such granular explosive may be prepared by incorporating the oxygen carrying crystals with asbestos with a small amount of water in a suitable mill until a homogeneous mass results. The mass is then subjected to moderate pressure and the resultant press cake dried and granulated.

Furthermore, the invention includes the incorporation of a small quantity of fibrous material with solid nitro bodies, for example, tri-nitrotoluol (with or without the addition of other salts) for the purpose of preventing caking of the cartridge.

When cartridges prepared as above described are subsequently impregnated with liquid fuels evaporation of the fuel from the mass of explosive is greatly retarded. Moreover, the cartridge assumes only a slightly moist consistency considering the amount of liquid added. The liquid constituent does not subsequently exude or drain out and is not easily expressed from the packet. Using 2% of asbestos up to 25% of fuel by volume has been added without subsequent exudation.

The following are examples of cartridges manufactured in accordance with the present invention:—

Example I

Potassium chlorate crystals are taken of the fineness ordinarily employed for chlorate cartridges or even somewhat coarser (i. e. capable of passing a screen having about 60 meshes per lineal inch) but preferably finer. These are mixed with a proportion of powdered asbestos fibre, say about 10% by weight of the crystals and are triturated together until the whole mixture is uniform. The resulting powder is thereafter incorporated by trituration in a further batch of chlorate crystals in the proportion of about

10% of the whole so that the resulting material contains only about 1% of asbestos fibre. Trituration is continued until the average size of the particles of the material is in the neighbourhood of one five-hundredths of an inch in diameter or less. The product is packed into cartridges in the usual way, preferably under pressure, so as to obtain a cartridge as dense as possible. The pressure may be applied in an ordinary filling machine and if the worm of the filling machine be loaded so as to apply a suitable pressure to the material a density as high as 1.6 or over may be obtained in the space of the cartridge containing the crystals. Finally, the cartridge is impregnated with a liquid fuel. It is found that there is no tendency to cake or bind either before or after impregnation of the cartridge with the fuel.

A cartridge manufactured in this manner will be found to burn quite uniformly, it remains soft and yielding over a considerable period and detonates better than cartridges of the usual kind.

Even if impregnated with nitro-bodies or admixed with solid nitro-bodies such as dinitro-toluol the cartridge remains soft during storage.

Example II

The procedure is the same as in Example I with the following ingredients:—

Solid bodies ground together:

	Parts by weight
Potassium chlorate	65. 5
Asbestos fibre	3
Sodium nitrate	30

Fuel:

Orthonitrotoluol	10
Kerosene	1
Castor oil	0. 5

The liquid ingredients are used for impregnating the compressed cartridge.

Example III

Solid ingredients:

	Parts by weight
Potassium chlorate	93
Potassium nitrate	5
Asbestos fibre	2

Potassium chlorate is first incorporated with the asbestos in a suitable mill. The potassium nitrate is dissolved in a small amount of water and added to the incorporated mass in the mill and the whole incorporated until a homogeneous mass results. The mass is next subjected to moderate pressure in a suitable press and the resultant "press cakes" dried. The dried "press cake" is then granulated and the grains immersed in the correct quantity of fuel for impregnation.

Although the mass of the grains is pressed to a considerable density, the presence of the asbestos imparts a certain porosity to the grains which enables the product to absorb fuels. Too great a pressure should not be used to press the mass or non-porous grains may result.

The wet mass from the mill may also be pressed into pellets. These are dried and impregnated with the necessary amount of fuel.

In place of potassium nitrate, other soluble salts, such as sodium nitrate, sodium chloride and potassium chloride can be used as binding agents. With potassium perchlorate, ammonium nitrate can also be used.

Any suitable liquid fuel can be used to impregnate the grains, such as kerosene, nitrobenzene, nitro-toluol, etc. or mixtures of same.

Example IV

The following is an example of preventing caking in a body other than an explosive charge:—

As an example of this aspect of the invention may be mentioned the use of finely divided asbestos in admixture with fine crystals of sodium nitrate. The presence of about 1 to 5% of asbestos powder ground to such a size that the average diameter of the particles is less than one five-hundredths of an inch, suffices to prevent binding of such a hygroscopic salt over apparently an indefinite period. In the application of this salt as a manure the invention provides the means to prevent binding and facilitate its more even distribution over the soil. Other manures may be treated in like manner and the invention comprises a manure or fertilizer consisting of crystals or powder of a fertilizing substance in admixture with a small proportion of an inert silicate such as is fibres not exceeding 5%.

I claim:—

1. A method of preventing caking of a crystalline mass which consists in intimately incorporating with the said mass a proportion of asbestos fibre not exceeding 5%.

2. A method of preventing caking of a crystalline mass which consists in triturating with the said mass a proportion of asbestos fibrees not exceeding 5%.

3. A method of preventing caking of a crystalline mass which consists in intimately incorporating with the said mass approximately 1% of asbestos fibres.

4. A method of preventing caking of a crystalline mass which consists in triturating with the said mass approximately 1% of asbestos fibres.

5. A cartridge comprising a crystalline main body of oxygen carrying crystals adapted for impregnation with a liquid fuel and a proportion of asbestos fibres not ex-

ceeding 5% intimately incorporated therewith.

6. A cartridge comprising a crystalline main body of oxygen carrying crystals adapted for impregnation with a liquid fuel and approximately 1% of asbestos fibres, intimately incorporated therewith.

7. In or for an explosive charge a cartridge packed with oxygen carrying crystals in intimate admixture with a proportion of asbestos fibres not exceeding 5%.

8. In or for an explosive charge a cartridge packed with oxygen carrying crystals in intimate admixture with approximately 1% of asbestos fibres.

In testimony whereof I have signed my name to this specification.

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