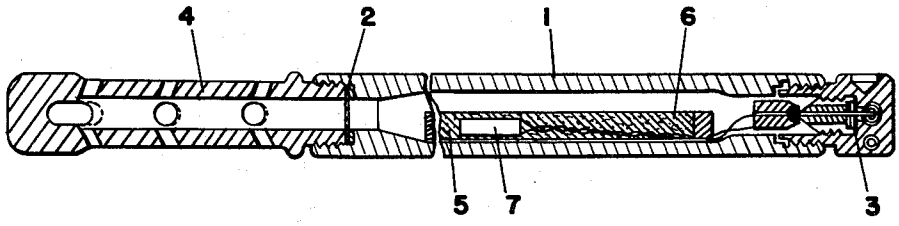
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BLASTING CHARGE COMPOSITION

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BLASTING CHARGE COMPOSITION

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1 Claim. (Cl. 52—14)

The present invention relates to compositions suitable for use as blasting charges in re-utilisable blasting assemblies and which are particularly suitable for use as blasting charges in dusty or fiery mines and which are capable of undergoing self-sustained flameless gas-producing thermal decomposition when locally heated under pressure.

Blasting devices have been widely used which comprise a pressure resisting container of tubular construction which is closed or fitted with a gas-tight closure at one end and fitted at the other end with a venting cap separated from the container by an expendable bursting disc adapted to yield at a predetermined pressure and which is fitted with electrical contacts to enable a local heating element to be electrically actuated. In a blasting device of this kind the blasting effect is produced by the discharge of the gases into the borehole through ports in the venting cap when the pressure within the container has built up sufficiently to cause the bursting disc to yield and a passage has been opened up between the container and the venting cap. The time taken for the discharge of the gases from the container into the venting cap and through the ports into the borehole after the yielding of the bursting disc is sufficient to result in a comparatively gentle heaving blasting effect, such as is desirable for such purposes as the production of lump coal.

In blasting devices of the aforementioned kind the charge commonly used consists essentially of an equimolecular mixture of sodium nitrite and ammonium chloride stabilised with an alkali such as magnesium oxide or sodium carbonate in amounts up to about 3% by weight. These charges when locally heated decompose in a non-detonating manner without flame in self-sustained fashion with the formation of sodium chloride, nitrogen and steam and under the rising pressure conditions experienced in the aforesaid blasting device this decomposition once initiated by the local heating element is greatly accelerated and almost immediately the gases are discharged without flame. This charge is initiated by a heating element which is normally a small electric blackpowder fuse. This practice has been possible because although a blackpowder fuse produces flame, the time taken for the decomposition of the stabilised mixture of sodium nitrite and ammonium chloride to build up a pressure sufficient to cause the bursting disc to yield is long enough for the fragments of the electric fuse to have burned out before the bursting disc yields.

Compositions based on mixtures of ammonium chloride and sodium nitrite are capable, when their decomposition is initiated by local heating to a moderately raised temperature, of supporting their gas generating decomposition at a visible rate throughout the whole mass of the composition even at atmospheric pressure. This is a distinct disadvantage for some purposes since in the event of any portion of a mass of the composition being heated accidentally the whole mass may react and produce dense clouds of unpleasant fumes. Thus underground loading of these charges in coal mines is not at present practicable. It is, therefore, desirable to obtain compositions capable of undergoing self-sustained decomposition only when initiated under pressure.

According to the present invention a blasting composition suitable for use as a main charge in blasting devices of the aforesaid kind comprises ammonium nitrate in amount from 55.0 to 75.0% by weight and calcium formate in amount from 45.0 to 25.0% by weight with, if desired, calcium stearate in amount up to 0.5% by weight.

The invention also resides in a blasting device which comprises a tubular container closed or fitted with a gas-tight closure at one end and having a venting cap at the other end, said venting cap being separated from communication with said container by an expendable bursting disc adapted to yield at a predetermined pressure, an electrically actuable local heating device, means for permitting pressure to be formed within the container and a main blasting charge comprising 55.0 to 75.0% by weight ammonium nitrate and 45.0 to 25.0% by weight calcium formate with, if desired, up to 0.5% by weight calcium stearate.

The means for permitting pressure to be formed within the container may be the said local heating device. Thus a gas-producing electrically actuable local heating device which will produce at least sufficient hot gas to raise the pressure within the pressure resisting container to several atmospheres may be, for example, a safety heating device as claimed in co-pending application Serial No. 397,328, December 10, 1953, now abandoned, wherein an electric initiating element and a heating composition are enclosed in a container and is characterised in that the heating composition comprises 66 to 45% by weight guanidine nitrate, 27 to 45% by weight potassium persulphate and 6 to 10% by weight cuprous chloride with, if desired, up to 1% by weight petroleum jelly and in that the container is adapted to release the gas formed within it on initiation of said heating composition. On the other hand the means for permitting pressure to be formed within the container may comprise for example a holder adapted to deliver gas under pressure and a non-return valve connected thereto and to an inlet into the container so as to permit the desired quantity of gas to be introduced into said container.

The heating device used with the composition of the invention is preferably one which will generate sufficient hot gas to raise the pressure inside the pressure resisting container to several atmospheres. Other kinds of heating devices can, however, be used.

The flameless gas generating charge compositions of the present invention have the great advantage that their decomposition can only be initiated if under pressure and will not initiate at atmospheric pressure. Thus they differ from the hitherto used compositions based on mixtures of ammonium chloride and sodium nitrite in that they are incapable of sustaining their own thermal decomposition through a mass as a result of mere local heating of a portion thereof at atmospheric pressure, so that even if a hot object should accidentally come into contact with a portion of a mass of the composition in a mine at atmospheric pressure decomposiiton will not be initiated. The fume produced in the blast is less in amount and less persistent than that obtained from compositions based on ammonium chloride and sodium nitrite and the gases are satisfactorily free from poisons or irritating constituents. The total amount of solid products formed is also much smaller than that formed from ammonium chloride/sodium nitrite compositions. Furthermore, any gaseous or solid materials projected are at too low a

temperature to ignite fiery or dusty atmospheres or to constitute any indirect ignition risk.

For use in blasting devices of the aforesaid kind the compositions of the present invention may be enclosed in a container which is preferably made of any convenient non-deflagrating, non-smoulderable material such as sheet metal, certain synthetic plastics such as the polyethylene polymers, certain synthetic resins such as polychloracrylates, or fireproofed cardboard but may be of combustible materials provided that the combustion thereof cannot be initiated by the heat of the decomposition. This container may be so shaped that it also contains the local heating element and thus enables the complete charge to be pre-packaged and makes loading easier and faster than has formerly been possible.

The invention is illustrated by the following example in which all percentages are by weight and with reference to the diagrammatic drawing attached hereto.

Example

A pressure resisting steel container 1 is of 680 ml. capacity, of 1¼ inch internal diameter and is provided with a bursting disc 2 of thickness 7/64 inch adapted to burst at a pressure of 12 tons/sq. in., a fusehead 3 and a discharge head 4. The pulverulent composition 5 consists of a charge of 210 gm. of a composition consisting of 65.0% ammonium nitrate (containing 0.05% acid magenta), 34.9% calcium formate and 0.1% calcium stearate packed in a glazed paper tube 6 of 0.9 inch in diameter and 23 inches long into the centre of which is embedded a local heating device 7 consisting of 22.5 gm. of a mixture of 60.0% guanidine nitrate, 31.5% potassium persulphate, 8.0% by weight cuprous chloride and 0.5% petroleum jelly wrapped in a fireproofed manilla envelope and provided with electrical actuating means. When the pressure resisting container 1 thus loaded is utilised in a borehole in known manner the blast takes place within 4 seconds with little fume and the fume evolved is relatively free from poisonous and irritating constituents.

What we claim is:

A pulverulent, non-detonating gas generating composition suitable for use in re-utilizable blasting devices consisting essentially of ammonium nitrate in amount from about 55 to 75% by weight, calcium formate in amount from about 25 to 45% by weight, and calcium stearate in amount up to about 0.5% by weight.

References Cited in the file of this patent

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