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EXPLOSIVE COMPOSITION CONTAINING PHOSPHORUS AND PARTICULATE COFFEE

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ABSTRACT OF THE DISCLOSURE

A cap sensitive explosive composition consisting of ammonium nitrate, soybean oil, red phosphorus, and dried coffee.

BACKGROUND OF THE INVENTION

In recent years cap sensitive explosives, such as dynamite, have been largely replaced or supplemented by blasting agents, due to the need for safer, and especially for more economical explosives. Because of their insensitivity, however, blasting agents suffer two main disadvantages; they cannot be detonated without special primers or boosters, and they usually require larger diameter boreholes than cap sensitive explosives to achieve detonation. Both these factors contribute to increased costs and inconvenience. Accordingly, there is a need for a cap sensitive explosive of increased safety and economy, comparable to that of most blasting agents.

SUMMARY OF THE INVENTION

This invention provides for an improvement in cap sensitive explosive compositions in that it is safer and more economical to manufacture and use. More specifically, this invention is an explosive composition consisting of, by weight, from 70% to 98% ammonium nitrate, from 2% to 20% soybean oil, from 0.2% to 10% red phosphorus, and from 0.1% to 8% dried coffee.

The ammonium nitrate used in this invention can be of fertilizer grade, which is offered in several forms, such as prilled, granular, crystalline, and grained. Although any of these forms can be employed, the prill type was used for most testing because of its availability. Other inorganic oxidizing salts may be substituted for ammonium nitrate, but are less preferable for use herein.

Soybean oil was chosen as the fuel component of the present explosive because field tests have shown it to be superior to other fuels in explosive performance, and especially in resistance to accidental detonation or ignition. Soybean oil, in the form of cooking oil, was used for testing purposes since only small quantities were needed. Cheaper grades, which are less pure, may be used for large scale production with equal explosive results. Although soybean oil is preferred, other fuels may be used with varying degrees of success. Some examples of these fuels are carbonaceous fuels, such as diesel fuel or sucrose; finely divided metals, such as aluminum or zinc; and self-explosives, such as nitrated cellulose or trinitrotoluene.

Elemental phosphorus has several allotropic modifications—yellow, red, and violet. Red phosphorus is the form used for this invention. White phosphorus, the more commonly known form of the element, is not suitable for use herein, because it ignites at room temperature and is extremely poisonous. The red form, occurring as a brownish red powder, does not burn below 260° C. and is not poisonous. Red phosphorus is employed in this novel explosive in extremely small amounts as a sensitizing agent. It is found that explosives composed of ammonium nitrate and some fuel, chosen from the group of those previously mentioned, can be rendered cap sensitive by the addition of red phosphorus in concentrations as small as 0.5% or less, by weight. Although much more powerful, the resulting explosives retain most of their original resistance to accidental ignition or detonation if the concentration is limited to a few percent. This is a totally unexpected result since explosives containing red phosphorus are generally considered to be very dangerous.

It is not expected that the addition of a substance such as dried coffee would significantly improve the performance of an explosive. Field tests have shown, however, that the addition of small amounts of dehydrated coffee increase the detonation velocity of the present composition. An even more unexpected result is that the blasting ability of the explosive is increased by about 50%. Since dried coffee has a rather low density, it would be anticipated that this material would play the role of a density lowering agent, which would result in an increase in the sensitivity of the explosive. However, this does not explain the observed results since density lowering agents usually lower both the detonation velocity and explosive power. The coffee made from beans grown in different location has different names—e.g., Java, Mocha, Brabils, etc. All these kinds may be used with equal results. By dried coffee is meant the product marketed as so called instant coffee. This is produced by making the drink from roasted coffee beans and then extracting the water to obtain a residual powder.

EXAMPLE OF THE INVENTION

The following is only one example of the present invention and should not be considered limitative thereof:

To 95 parts of ammonium nitrate fertilizer in a rotary mixer is added 2 parts of water and 3.5 parts of soybean oil. This is mixed at about 170° F. until the water is evaporated, and the mixture is soft enough to be crumbled in the hand. After cooling to about 80° F., one part of red amorphous phosphorus and 0.5 parts of dried coffee are added. The result is mixed for about 8 minutes at room temperature. Then, preferably, the average particle size of the composition is reduced to about 100 mesh or smaller by the addition of large wooden balls and continued mixing.

The resulting composition is packed in container suitable for use and has the following percentage composition by weight:

Component:	Percent
Ammonium nitrate	95.0
Soybean oil	3.5
Red phosphorus	1.0
Dried coffee	0.5
Total	100.0

In field tests the composition of this example proved to be very reliably detonated by one No. 6 blasting cap, with equal or superior earth moval and rock breakage as compared to 60% strength dynamite. Even at temperatures as low as −10° F., detonation was achieved with a No. 6 cap with no observed loss in explosive power. Propagation occurred in unconfined diameters as small as one inch.

As one test of resistance to ignition or detonation by shock, tin cans, each containing 200 grams of the present example, were shot 50 times by a .22-cal. rifle, 6 times by a British .303-cal. high-powered rifle, and 6 times by a 20-gauge shotgun. The shots were fired from a distance of 50 feet, and in no case did the explosive ignite or detonate. The remaining explosive in these containers was then detonated by one No. 6 blasting cap. One possible explanation of these results is that the shock wave velocity required for self-sustaining detonation is greater than that produced by most rifle ammunition, up to about 3000 feet per second, but less than that produced by the explosive in a blasting cap, about 20,000 feet per second.

As one test of resistance to ignition or detonation by heat a 400 gram sample of the example was directly exposed to the flame of a propane torch for one minute. Although part of the composition was badly charred, as though it had burned while in the flame, there was no observed burning after the flame was removed, and a good portion of the explosive remained intact.

In another test 100 grams of a thermic composition, composed of powdered zinc, sugar, and potassium nitrate, was poured over a 200-gram sample of the present example and ignited. When the thermic composition had burned, inspection revealed that, although the top layer of the sample had melted and charred, the interior material remained unburned.

The costs of component materials for large scale production of the above example of this invention would be about $100 per ton of explosive. Since the composition of this invention contains no self-explosives as such, a great deal more safety can be realized in the manufacturing process as compared to other cap sensitive explosives, having high explosive components.

I claim:

1. An explosive composition consisting of, by weight:
(a) about from 70% to 98% ammonium nitrate,
(b) about from 2% to 20% of a fuel chosen from the group carbonaceous fuels, such as diesel fuel or soybean oil; finely divided metals, such as aluminum or zinc; and self-explosives, such as nitrated cellulose or trinitrotoluene,
(c) about from 0.2% to 10% red phosphorus,
(d) about from 0.1% to 4% of particulate instant coffee, wherein by "instant coffee" is meant the product obtained by removing the water from the drink made from roasted coffee beans.

2. The composition of claim 1 wherein the fuel component is soybean oil.

References Cited

UNITED STATES PATENTS

656,678	8/1900	Stransky	149—82
1,141,009	5/1915	Schanandoah	149—85
1,640,224	8/1927	Robinson	149—29 X
2,130,115	9/1938	Biddle	149—29 X
2,132,996	10/1938	Palmieri	149—29
2,970,900	2/1961	Woodring et al.	149—29 X

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