Patented Feb. 11, 1936

2,030,096

UNITED STATES PATENT OFFICE

2,030,096

BLACK POWDER COMPOSITION

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No Drawing. Application May 18, 1933, Serial No. 671,700

12 Claims. (Cl. 52—17)

This invention relates to modified black powder compositions, and more particularly to such compositions containing ammonium nitrate as a portion of the oxidizing material.

The composition of black powder generally has consisted essentially of potassium or sodium nitrate, sulfur, and charcoal. In the black blasting powders in common use in this country, sodium nitrate has been the oxidizing ingredient used, and a representative composition prior to the present invention has comprised approximately 72% sodium nitrate, 10% sulfur, and 18% charcoal.

The advantages of black blasting powder as a commercial explosive have been that it possesses a relatively low velocity of decomposition, in distinction from the high velocity dynamites. Because of this low velocity, in the blasting down of coal for example, a larger percentage of lump coal is obtained by the use of black powder. Black blasting powder has been used in the granular form until recent years, the grains being given a smooth polished surface coating by the operation known as "glazing". The most commonly used powder at the present time, however, is in the form of cylindrical pellets wrapped in paper sticks similar to dynamite cartridges. Black blasting powder pellets are ordinarily made in blocks about 2" in length and of any desired diameter, up to approximately 2", for example.

While sodium nitrate has been the customary oxidizing ingredient in such powders, various proposals have been made to replace a portion of the sodium nitrate by ammonium nitrate. Such a replacement has had a number of advantages, particularly in giving greater potential strength to the powders, since ammonium nitrate produces gaseous products only on combustion, whereas a relatively large proportion of the sodium nitrate is left as solid residue. A further advantage comes from the fact that the use of ammonium nitrate as a partial replacement of the sodium nitrate allows the attainment of a lower density pellet powder. This low density feature is desirable in many cases, since it gives a greater number of sticks per pound of explosive, the strength per stick still being sufficient to give the desired execution.

Ammonium nitrate is a highly hygroscopic compound and it is necessary in the case of pellets containing it, and in fact with all pellets, to free the pellets from moisture before final packing, by drying at a relatively elevated temperature, for example 95° C. In drying ammonium nitrate powders, the disadvantage has been encountered that these powders exhibit a tendency to spontaneous ignition on drying at elevated temperatures, thereby introducing a decided hazard into the manufacturing operations.

The object of my invention is a modified black powder composition possessing a high degree of thermal stability. A further object is such a powder containing ammonium nitrate as a portion of the oxidizing materal, and having the composition so adjusted that the tendency to spontaneous ignition on heating is removed. Further objects will be described as the invention is disclosed hereinafter.

I have found that the above objects are accomplished when the black powder composition contains a stabilizing ingredient consisting of a solid organic basic compound. While the inclusion of such an ingredient is particularly desirable in black powders containing ammonium nitrate as a portion of the oxidizing material, I may include this stabilizer to advantage also in all types of black powders. Various compounds may be used, with beneficial results, preferably from the class of solid aliphatic basic compounds, for example guanidine, dicyandiamide, urea, and the like. Various aromatic basic compounds likewise may be employed, such as diphenylamine. Preferably I make use of urea for bringing about the desired results.

As an illustrative example of a black blasting powder, made in accordance with my invention, the following may be cited, in comparison with a similar powder containing no stabilizing ingredient of the type described:

	Per cent	Per cent
Sodium nitrate	60.5	60.0
Sulfur	10.0	10.0
Charcoal	18.0	17.8
Ammonium nitrate	10.0	10.0
Calcium carbonate	1.5	1.2
Urea	----	1.0

The stabilizing value of the urea present in the second example above may be seen from the fact that the powder, containing no urea, fired spontaneously after 48 hours' heating at 96° C., and after 7 to 8 hours at 104° C. The powder containing the urea, on the other hand, fired only after 19 hours at 116° C. While urea or other stabilizing ingredient of the class described may be used in a wide range of amounts, I preferably include the urea in an amount between 0.2 and 10.0%. Other quantities may be used, but amounts below the lower limit given are substantially insufficient to bring about the desired

effect on the powder composition, while more than 10% is undesirable because of its effect on the explosive properties of the powder. It will be understood also that the various organic basic compounds suggested herein will act as combustible in the explosive, as well as in the capacity of stabilizing agent.

The stabilizing ingredient according to my invention may be included with advantage in all forms of black blasting powder, whether granular or pelleted. Likewise it is applicable in low density powders of the type that is obtained by packing the powder in wet condition into prepared and pre-formed shells, and subsequent drying in the shell by means of heat. In fact, the desirability of powders containing a solid organic basic compound as a stabilizer is emphasized particularly, the greater the amount of moisture present for removal, with consequent necessity for maintaining at a relatively high temperature for a considerable period of time.

Having described my invention in detail in the foregoing, I intend to be limited only as indicated in the following claims.

I claim:

1. The process of stabilizing a modified black powder composition which comprises incorporating therein an ingredient comprising a solid organic basic compound.

2. The process of stabilizing a modified black powder composition which comprises incorporating therein a solid aliphatic basic compound.

3. A modified black powder composition having its degree of stability substantially increased by an ingredient incorporated therein comprising a solid organic basic compound.

4. A modified black powder composition containing ammonium nitrate as a portion of the oxidizing material, said composition having its degree of stability substantially increased by an ingredient incorporated therein comprising a solid organic basic compound.

5. A modified black powder composition having its degree of stability substantially increased by an ingredient incorporated therein comprising a solid aliphatic basic compound.

6. A modified black powder composition containing ammonium nitrate as a portion of the oxidizing material, said composition having its degree of stability increased by an ingredient incorporated therein comprising a solid aliphatic basic compound.

7. The composition of claim 4 in which the solid organic basic compound is diphenylamine.

8. The composition of claim 4 in which the solid organic compound is dicyandiamide.

9. The composition of claim 4 in which the solid organic basic compound is urea.

10. A modified black powder composition comprising ammonium nitrate, a second inorganic nitrate, sulfur and charcoal, said composition having its degree of stability increased by an ingredient incorporated therein comprising a solid organic basic compound.

11. A modified black powder composition comprising sodium nitrate, ammonium nitrate, sulfur, charcoal, and sufficient urea to act as a stabilizer.

12. A modified black powder composition containing ammonium nitrate as a portion of the oxidizing material and a stabilizer comprising 0.2 to 10.0% of urea.

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