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CAST FLARE COMPOSITION OF MAGNESIUM OR TITANIUM DISPERSED IN A MATRIX

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5 Claims

ABSTRACT OF THE DISCLOSURE

Cast pyrotechnic flares for emitting yellow light have magnesium or titanium dispersed in a matrix of sodium oxalate, sodium nitrate and calcium nitrate or sodium nitrite.

This invention relates to colored illuminating flares and more particularly to cast pyrotechnic flares that burn to provide yellow light.

Pyrotechnic flares giving yellow light have heretofore been conventionally prepared by compressing a mixture of sodium nitrite, sodium oxalate, organic binder and a metal fuel. Such compressed flares, containing organic material are impact sensitive and will almost invariably ignite when hit by, for example, 30-caliber ball ammunition at a distance of 200 yards. In United States Patent 3,370,537, Tepper has cast pyrotechnics in which a finely divided metal fuel is dispersed in a matrix of oxidizing salts such as alkali metal and alkaline earth metal nitrates. Cast pyrotechnics are desirable in that they are free of organic material, have a high density and are highly uniform.

In accordance with this invention, a high intensity yellow flare, that is substantially less sensitive to ballistic impact than prior flares, contains finely divided magnesium or titanium dispersed in a matrix of sodium oxalate, sodium nitrate and sodium nitrite or sodium oxalate, sodium nitrate and calcium nitrate. I have found that sodium oxalate can be dissolved, without decomposition, in molten mixtures of sodium nitrate-sodium nitrite and sodium nitrate-calcium nitrate. The metal fuel is mixed into the molten salts and the mixture is cooled to freeze the salt mixture forming a solid continuous phase, or matrix, in which the metal is dispersed.

The flares may contain 20–25 weight percent metal fuel, the remainder being the salt mixture of oxidizer and colorant. Suitable salt mixtures contain from 30–50 weight percent sodium oxalate, the remainder being a low melting mixture of sodium nitrate-sodium nitrite or sodium nitrate-calcium nitrate. With less than about 30 percent sodium oxalate, the color intensity is poor and with over about 50 percent sodium oxalate, the mixture does not burn reliably. The linear burning rate, that is the rate at which a burning front proceeds lengthwise along a flare

ignited at one end, decreases from about 5 inches per minute to about 3 inches per minute, when the sodium oxalate is increased from 30 to 50 percent. The color intensity varies inversely with burning rate. The low melting mixtures are preferably eutectics; namely, 52 weight percent sodium nitrate—48 percent calcium nitrate melting at 232° C. and 55 weight percent sodium nitrate—45 percent sodium nitrite melting at 226° C. Other mixtures melting below about 300° C. may be used.

Illustrative of this invention, 5 parts of sodium nitrate-calcium nitrate eutectic was melted and 3 parts of sodium oxalate was added to and dissolved in the melt. Two parts of 70 mesh magnesium was mixed into the melt and the resultant slurry was cast into a flare mold. A 350 gram flare 7 inches long burned for 2 minutes giving an intense yellow light.

The flares of this invention are highly resistant to accidental ignition or explosion by ballistic impact. For example, they are non-igniting when struck by 30-caliber ammunition, either ball or armor piercing, fired at a distance of 30 feet or greater.

I claim:

1. A flare composition for yellow illumination having finely divided magnesium, titanium or mixtures thereof dispersed in a matrix of solidified molten salt mixtures consisting essentially of (a) sodium oxalate, (b) sodium nitrate, and (c) a salt selected from the group consisting of sodium nitrate, calcium nitrate, or mixtures thereof.

2. A composition according to claim 1 containing about 20–25 percent dispersed phase.

3. A composition according to claim 2 in which the matrix contains from about 30 to 50 percent sodium oxalate.

4. A composition according to claim 3 in which the remainder of the matrix consists of 52 percent sodium nitrate and 48 percent calcium nitrate.

5. A composition according to claim 2 in which the remainder of the matrix consists of 55 percent sodium nitrate and 45 percent sodium nitrite.

References Cited

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149—41, 43, 45, 61

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,488,237 January 6, 1970

Ralph H. Hiltz

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 24, "nitrite" should read -- nitrate --.
Column 2, line 28, "nitrate", first occurrence, should read -- nitrite --.

Signed and sealed this 27th day of October 1970.

(SEAL)
Attest:

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