(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 372 893 A2**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **89312639.1**

(22) Date of filing: **04.12.89**

(51) Int. Cl.[5]: **C06C 7/00, C06B 23/00, C06B 41/02**

(30) Priority: **05.12.88 AU 1757/88**

(43) Date of publication of application:
13.06.90 Bulletin 90/24

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

(71) Applicant: **THE COMMONWEALTH OF AUSTRALIA**
c/o Department of Defence Assistant Secretary Industry Operations Anzac Park West Building
Canberra A.C.T. 2600(AU)

(72) Inventor: **Bentley, John R.**
c/o Materials Research Laboratory P.O. Box 50
Ascot Vale Victoria 3032(AU)

(74) Representative: **Hale, Stephen Geoffrey et al**
J.Y. & G.W. Johnson Furnival House 14/18 High Holborn
London WC1V 6DE(GB)

(54) Conducting primer compositions.

(57) A conducting composition for detonators having insensitivity to one amp of current or one watt of power consisting of 40 to 80 percent by weight of lead styphnate, 2 to 10 percent by weight of carbon black and/or graphite and the balance lead oxide or other exposive or non-explosive material. Firing times of less than eight milliseconds can be achieved where at least one percent of graphite is included in the composition.

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CONDUCTING PRIMER COMPOSITIONS

This invention relates to conducting compositions for use in primers and for use in detonators.

Generally, electrically activated explosives use bridge wire devices for actuation. Such devices are relatively expensive and difficult to produce.

The present invention is particularly concerned with applications where power insensitivity is particularly important.

US-A-4605453 discloses a conducting composition for use in a firing cap, which comprises normal lead styphnate having a mean particle size not less than 55 microns in admixture with carbon black which has a mean aggregate size between 5 and about 15 microns and which has high energy insensitivity. The power sensitivity however is particularly low. Devices containing these compositions can be initiated with power of less than one watt. It is important in designing primers and detonators that they comply with a requirement of being insensitive to both one amp and one watt.

It is an object of the present invention to provide a conducting composition which complies with these requirements.

To this end the present invention provides a conducting composition suitable for use in a detonator, consisting of

2 to 10 percent by weight of carbon black and/or graphite,

40 to 80 percent by weight of lead styphnate,

the balance being lead oxide or other explosive or non-explosive material,

said composition being formulated to ensure insensitivity to one amp of current or one watt of power.

It is preferred that the conducting composition utilise normal lead styphnate which has a mean particle size not less than 5 microns in admixture with carbon black or graphite which has a mean aggregate size between 0.5 microns and 15 microns.

However, a failing of the compositions taught in the US Patent is that they do not have good power or current insensitivity.

It is a preferred requirement of one aspect of the present invention that the content of carbon black is adjusted to provide resistance within the range of half to three ohms. This requirement compares with resistance levels ranging upwards from 16 ohms in US-A-4605453.

In preparing compositions according to this aspect of the present invention, the voltage and current sensitivities are approximately the same and this can be achieved by preferably adjusting the composition to have a nominal resistance of approximately 1 ohm.

However, where resistance is lower the speed or firing time of devices containing the composition is relatively slow. Generally, for resistances of 0.8 to 1.2 ohms and a firing current of 5 amps firing times of greater than 50 milliseconds are expected.

In another preferred aspect of this invention compositions of firing times less then 50 milliseconds and preferably less than 8 milliseconds for a firing current of 5 amps are provided which still satisfy the one amp, one watt insensitivity requirement. This is achieved by using graphite which has a higher conductivity than carbon black and adjusting the final resistance to 1.3 - 3 ohms. The graphite can replace all or some of the carbon black depending on the desired functioning time. Preferably at least one percent by weight of graphite is used.

It is to be noted that the firing time decrease is achieved with an increase in resistance, and thus the current insensitivity may approach the threshold of one amp if the resistance is too high.

The following are particular examples of preferred formulations of this invention.

Example 1

One preferred formulation of the present invention comprises a conducting composition having the following composition:

Carbon Black (Tintacarb)	7.5% by weight
Lead Oxide	30.0% by weight
Lead Styphnate	62.5% by weight

The energy and power sensitivity were determined from Breucton tests. Results were as follows:

ENERGY	Capacitance 2.95 μF
	Increment 0.05 (log units)
	Number Tested 25
	Mean 3.764 (5808 μJ)
	S.Dev 0.041 (log units)
	Energy Threshold 3.98 mJ
POWER	Constant Current Supply
	Increment 0.1A
	Number Tested 25
	Mean 2.3A
	S. Dev 0.18A
	Threshold Current 1.58A
	Threshold Power = I^2R min = 2.5 W

Example 2	
Carbon Black (Tintacarb)	2% by weight
Graphite	2% by weight
Lead Styphnate	66% by weight
Lead Oxide	30% by weight

This composition had a firing time of less than 8 milliseconds and was insensitive to one amp of current and one watt of power.

Example 3	
Carbon Black	3.5% by weight
Graphite	1% by weight
Lead Styphnate	64.5% by weight
Lead Oxide	31% by weight

This composition had a firing time of less than 8 milliseconds and was insensitive to one amp of current and one watt of power.

The compositions of the present invention are useful in any situation where bridge wire devices are required to be replaced by a cheaper yet power-insensitive device. A typical application is in relation to automobile crash bags where an electrically activated explosive charge is required to initiate inflation of the protective bag and the risk of unintended initiation must be low.

These conducting compositions can be used wherever electrically initiated detonators or igniters are used and can be formulated for a wide range of firing times and still be insensitive to one amp of current or one watt of power.

From the above description it can be seen that the present invention provides a new and useful conducting primer composition which overcomes difficulties associated with alternative initiating devices.

Claims

1. A conducting composition suitable for use in a detonator, consisting of
2 to 10% by weight of carbon black and/or graphite,
40 to 80% by weight of lead styphnate,

the balance being lead oxide or other explosive or non-explosive material,
said composition being formulated to ensure insensitivity to one amp of current or one watt of power.

2. A composition as claimed in claim 1, wherein normal lead styphnate is used in conjunction with carbon black or graphite to produce a resistance of between a half and 3 ohms.

3. A composition as claimed in claim 1 or 2, wherein the lead styphnate has a mean particle size of not less than 5 microns and the carbon black and/or graphite has a mean aggregate size of from 0.5 to 15 microns.

4. A composition as claimed in any of claims 1 to 3, wherein at least 1% by weight of graphite is present with or without carbon black and the resistance is 1.3 to 3 ohms.

5. A composition as claimed in any of claims 1 to 4, consisting only of carbon black, graphite, lead styphnate and lead oxide.

6. An electrically initiated detonator, primer or igniter incorporating a conducting composition as claimed in any of claims 1 to 5.

7. A detonator, primer or igniter as claimed in claim 6, in which the firing time is less than 8 milliseconds and the composition incorporates at least 1% by weight of graphite.