

[54] **HIGH TEMPERATURE DETONATOR**

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Energy Commission

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[58] Field of Search 102/28 EB; 149/88

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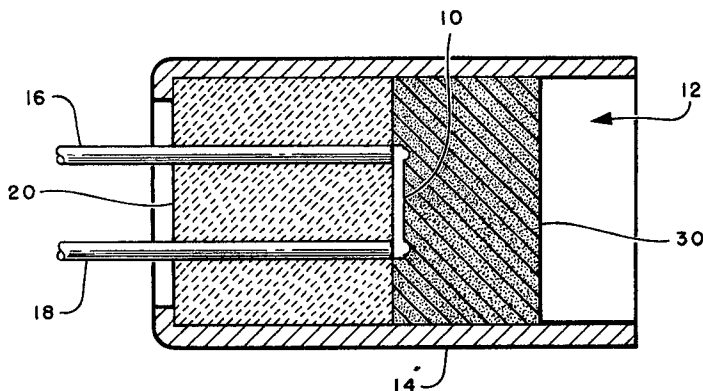
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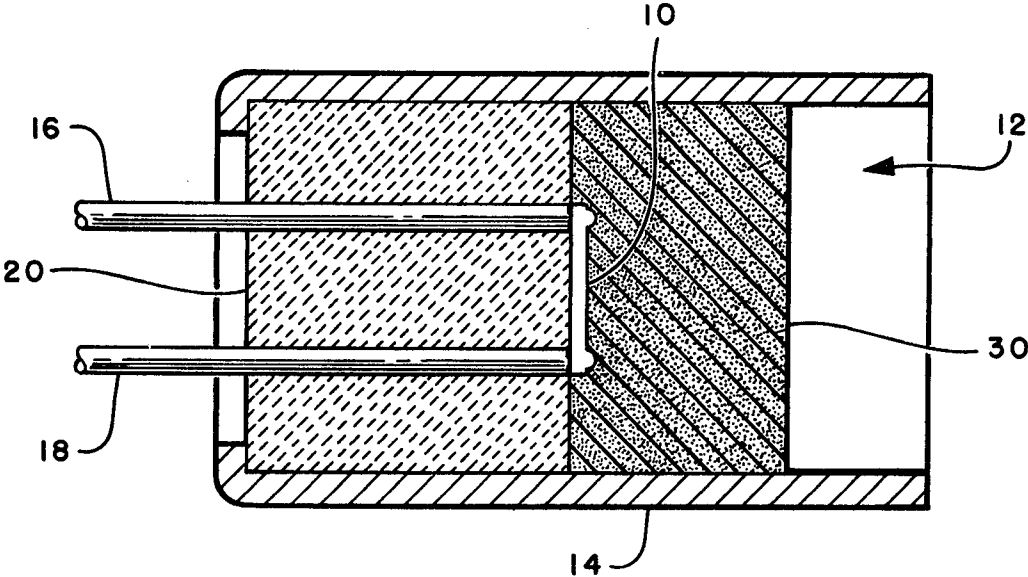
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ABSTRACT

A high temperature or radiation resistant exploding bridge wire detonator having an azo-bis-hexanitro-biphenyl explosive charge positioned adjacent the exploding bridge wire.

3 Claims, 1 Drawing Figure





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HIGH TEMPERATURE DETONATOR

BACKGROUND OF INVENTION

There are applications where components and equipment may be subjected to high temperatures or radiation for relatively long periods of time. Such applications may include interplanetary rockets or other space operations exposed to solar heating, radiation or particles, high speed aircraft, components which may be subject to fire, underground explorations, and the like. In many of these applications, it may be desirable to utilize explosive detonators to initiate an event or perform some useful function, for example case separation or other cutting function, a protective or safety function, or the like. When most explosives are subjected to high temperatures or radiation for significant or even short periods of time, they may be degraded or partially expended to a point where they will fail to properly ignite with detonator speed and force. Some explosives which may survive at elevated temperatures are primary explosives and thus very hazardous to handle and use.

Attempts have been made to overcome these problems by using conventional detonators maintained at ambient or reduced temperature by appropriate cooling or insulating means at a location remote from the desired function or task to be performed. The detonator is then used to initiate a length of high-temperature resistant mild detonating fuze and the detonation front carried by the fuze into the high temperature location where the specific task may be performed. Such arrangements may place an additional burden on the system by requiring extra cooling or cooling not otherwise needed and by introducing additional points of possible failure into the system.

SUMMARY OF INVENTION

It is an object of this invention to provide an improved exploding bridge wire detonator, which may be subjected to elevated temperatures or radiations without being detrimentally affected.

Various other objects and advantages will appear from the following description of the invention, and the most novel features will be particularly pointed out hereinafter in connection with the appended claims. It will be understood that various changes in the details, materials and arrangements of the parts, which are herein described and illustrated in order to explain the nature of the invention, may be made by those skilled in the art.

The invention comprises a high temperature exploding bridge wire detonator utilizing a thermally stable explosive charge adjacent to the exploding bridge wire.

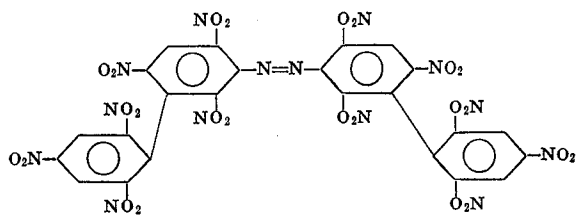
DESCRIPTION OF DRAWING

The invention is illustrated in the accompanying drawing of a cross-sectional view of a bridge wire detonator of this invention.

DETAILED DESCRIPTION

Referring to the drawing, the detonator includes a bridge wire 10 positioned and supported within a cavity 12 of a detonator casing or housing 14 by a wall of the cavity and by a pair of electrical leads or terminal members 16 and 18. Leads

16 and 18 are supported and electrically insulated from each other by an appropriate plastic, glass, ceramic, or other electrically insulating feedthrough member 20, which may be threaded or otherwise secured within cavity 12 of a casing 14. Bridge wire 10 is at least partially embedded in or otherwise positioned in intimate contact with explosive column 30. Explosive column 30 is a pellet or mass of azo-bis-hexanitrobiphenyl explosive at a density of from about 0.6 to 1.3 grams per cubic centimeter which may be preformed and inserted in cavity 12 or pressed directly into cavity 12 by appropriate means. An additional explosive or a fuze or the like (not shown) may be positioned adjacent explosive column 30 in cavity 12 to perform some desired task or to increase the effectiveness of the detonator. The bridge wire may be exploded and detonator initiated by closing a suitable switch to connect an appropriate electrical power source such as a battery charged capacitor (not shown) across leads 16 and 18. Azo-bis-hexanitrobiphenyl, a secondary explosive of unusual thermal stability, may be described by the following diagram.



In one instance azo-bis-hexanitrobiphenyl powder was pressed into the cavity of an exploding bridge wire detonator against a 0.0015 inch diameter by 0.060 inch long gold bridge wire. Explosive column 30 was 0.22 inches in diameter by 0.30 inches long at a density of 0.80 grams per cubic centimeter. When the detonator was heated in an oven at 530° F and maintained at that temperature for 2.5 hours, the detonator was fired by a capacitor charged to 1,500 volts while still at the 530° F temperature. The detonator initiated a length of flexible linear shape charge containing the explosive hexanitrostilbene.

Azo-bis-hexanitrobiphenyl exploding bridge wire detonators were initiated at room temperature with firing voltages of from about 2 to 4 kilovolts and resulted in an average function time of about 3.35 microseconds. There is a wide range of values for explosive bulk density (such as 0.6 to 1.3 grams per cubic centimeter), bridge wire size and material, and explosive column dimension that may be used successfully with this explosive. This explosive may be detonated at temperatures as high as 750° F.

What is claimed is:

1. A detonator for use at temperatures to about 750° F comprising a detonator casing having a cavity for an explosive material, azo-bis-hexanitrobiphenyl explosive within said cavity, and an explodable bridge wire positioned against said explosive.

2. The detonator of claim 1 wherein said explosive is at a density from about 0.6 to 1.3 grams per cubic centimeter.

3. The detonator of claim 1 wherein said bridge wire is gold and said explosive is ignitable at a voltage of about 1,500 volts.

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