United States Patent

Betts

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[54] **DELTA SQUIB CIRCUIT**

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[51] **Int. Cl.** **F42c 19/12**

[58] **Field of Search** ..... 102/28, 28 M, 28 EB

[56] **References Cited**

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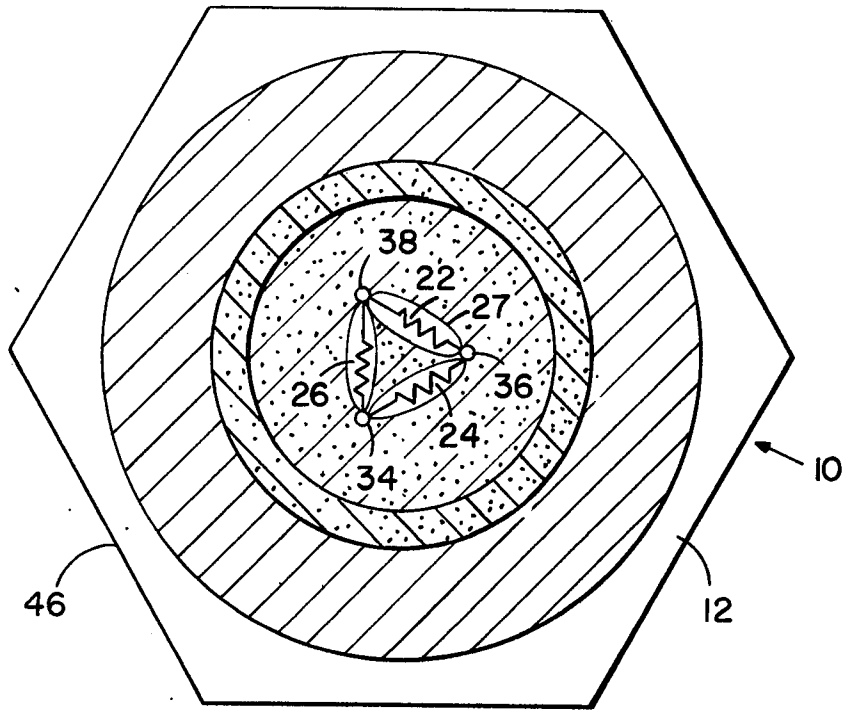
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[57] **ABSTRACT**

An electroexplosive device disposed for energization for creating a spark flame and/or gaseous discharge which is utilized to perform a work function such as igniting the propellant igniter in a rocket to initiate launch thereof.

4 Claims, 2 Drawing Figures



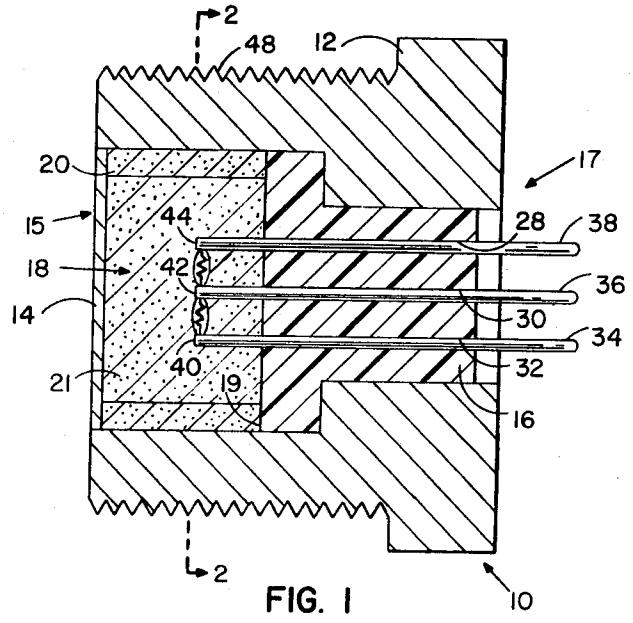


FIG. 1

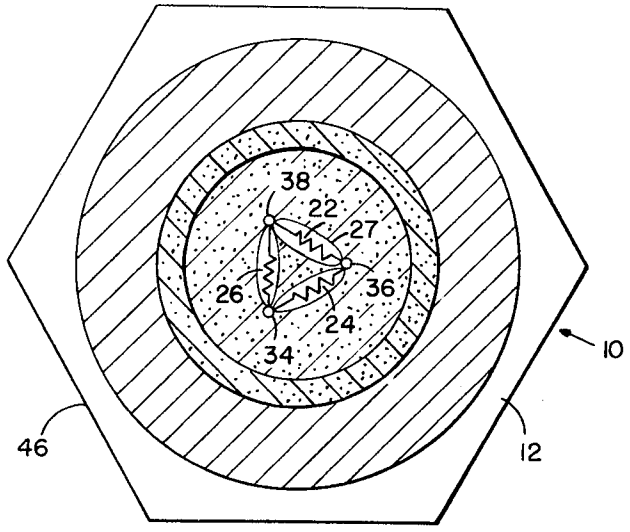


FIG. 2

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DELTA SQUIB CIRCUIT

BACKGROUND OF THE INVENTION

Modern weapons and missiles utilize solid fuels as propellants in many applications. Such systems typically are provided with a propellant, a combustion chamber and igniter components. The propellant may be one of many suitable chemical compounds presently available. Typically, the propellant is stored and burned in the combustion chamber. The propellant is ignited by an igniter, which is activated by an initiator. The igniter is positioned in the combustion chamber with the initiator in the igniter. This initiator is usually composed of small charges of pyrotechnics or explosive powders that can be easily ignited by a spark discharge or a hot wire which provides sufficient temperature to ignite the igniter, in turn igniting the main propellant charge.

Some conventional initiators use a single bridge wire connected across a pair of terminals and when an electrical potential is applied across the terminals, the bridge wire is heated or exploded to provide the impetus for the desired reaction. Other electroexplosive devices use double bridge wires in parallel or series circuit arrangements. A conventional parallel circuit includes a first bridge wire connected between a first pair of terminals and a second bridge wire disposed in parallel relation with the first wire and connected between a second pair of terminals. In this arrangement, an electrostatic difference between the two circuits may cause inadvertant ignition by sparking between the two circuits through the pyrotechnic. Another conventional type of electroexplosive device utilizes a first bridge wire connected between a first and second terminal, a second bridge wire connected between the second and a third terminal to provide a series circuit. However, difficulty arises in the use of this type of circuit in that the first and third terminals are not common for a series circuit and pin orientation must be maintained to insure proper connection to the firing circuit.

The device of the present invention includes a squib utilizing a Delta circuit arranged in series-parallel relation to overcome the above noted difficulties.

SUMMARY OF THE INVENTION

An electroexplosive device having a trio of terminals extending externally of a body enclosing an igniter charge. A triangular circuit (Delta circuit) includes a plurality of bridge wires connected across the terminals, in the interior of the body, adjacent a propellant charge mounted in the body. The Delta circuit includes a first bridge wire connected between the first and second terminals and a second bridge wire connected between the second and third terminals, and a third bridge wire connected between the third and first terminals, to provide a series-parallel Delta circuit.

It is, therefore, an object of the present invention to provide an electroexplosive device having a combined series-parallel circuit therein.

Other objects and advantages of the present invention will be more readily apparent from the following description and drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a elevational sectional view of an igniter squib utilizing the Delta circuit of the present invention.

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1 illustrating the Delta circuit of my invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIG. 1, an igniter squib **10** includes a housing **12** having an end closure **14** at one end **15** thereof and an insulating member **16** carried in the housing adjacent a second end **17** thereof. A cavity **18** is formed intermediate end closure **14** and an interior surface **19** of insulating member **16**. Cavity **18** is provided therein with a pyrotechnic pelleted charge **20** which encloses a pyrotechnic powder charge **21**, and a plurality of bridge wires **22, 24** and **26** (FIG. 2) having a bead or charge of lead azide or the like coated thereon.

To provide for external connection to bridge wires **22, 24** and **26**, the insulating member **16** is provided with a plurality of apertures **28, 30** and **32** through which a plurality of terminals **34, 36** and **38** extend. Bridge wires **22, 24** and **26** are connected to the terminal ends **40, 42** and **44** of terminals **38, 36** and **34** respectively.

As shown in FIG. 2, terminals **34, 36** and **38** are in a triangular arrangement having a first bridge wire **22** connected to terminals **36** and **38**, the second bridge wire **24** is connected to terminals **36** and **34**, and a third bridge wire **26** is connected to terminals **38** and **34**. Thus, any two pins connected externally of the squib forms a series-parallel circuit.

Body **12** includes a hexagonal base portion **46** and a threaded portion so that the initiator may be easily installed in threaded relation in the igniter. The hexagonal portion permits facile assembly by a wrench or the like.

It should be obvious, therefore, that applicant has provided a squib circuit which lends itself to facile assembly in an igniter circuit of rockets and the like, in that any two pins of applicant's device may be connected external to the squib to form a series-parallel circuit without regard to pin orientation. Additionally, since it is sometimes necessary to check the squib devices prior to installation and since low resistance wires are used in such circuits, the ability to detect a broken wire by simple resistance measurements is made easier in the present device since the resistance change in Delta circuits are greater than conventional circuits.

I claim:

1. An electroexplosive initiator comprising:
   a. a housing enclosing a propellant charge;
   b. three of terminals each having a first end carried in said housing adjacent said propellant charge and a second end extending out of said housing; and,
   c. bridge wire means connected to said first end of said terminals in a Delta circuit relationship.

2. A device as set forth in claim 1 wherein said three terminals are mounted in said housing in a triangular arrangement and wherein said bridge wire means are a low resistance wire connected between said terminals.

3. A device as set forth in claim 2 wherein said bridge wire means includes a first bridge wire connected between a first and second of said three terminals, a second bridge wire connected between said second and the third of said three terminals, and, a third bridge wire connected between said third and said first terminals.

4. A device as set forth in claim 3 including a closure plate disposed adjacent a first end of said body, an insulating member mounted in said body adjacent the second end thereof and in spaced relation with said closure plate to form a cavity therebetween, said terminals extending into said body through said insulating members, and, said bridge wires being connected adjacent the ends of said terminals which terminate in said cavity.

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