The disclosure is directed to a bidirectional slapper detonator. One embodiment utilizes a single bridge circuit to detonate a pair of opposing initiating pellets. A line generator embodiment uses a plurality of bridges in electrical series to generate opposing cylindrical wavefronts.

[57] ABSTRACT

2 Claims, 6 Drawing Figures
25.4 μm KAPTON IS FLYER MATERIAL IN BOTH DIRECTIONS

4.6 μm COPPER CIRCUIT

BRIDGE 24

HOLE ETCHED IN COPPER

CIRCUIT INSULATOR 16

RELIEF HOLE 22

Fig. 2

BARREL HOLDER 30

INITIATING PELLET 32

SAPPHIRE BARREL 28

BARREL HOLDER 30

INITIATING PELLET 32

Fig. 3
BIDIRECTIONAL SLAPPER DETONATOR

BACKGROUND OF THE INVENTION

The field of the invention relates to slapper detonators and more particularly to bidirectional slapper detonators. This invention is the result of a contract with the Department of Energy (Contract No. W-7405-ENG-36).

Slapper detonators are used to detonate high explosive charges, particularly relatively insensitive high explosives.

One of the prior art slapper detonators uses a fragment, flyer or slapper driven across a gap to impact a single explosive acceptor charge. The slapper is driven across the gap by an electrically exploded metal foil. In accordance with the invention, a single electrically exploded metal foil can be utilized to simultaneously propel two slappers in opposite directions.

SUMMARY OF THE INVENTION

One object of the present invention is to simultaneously detonate two opposed high explosive charges. Another object of the invention is to provide good uniform hemispherical detonation simultaneously in two opposing directions.

One advantage of the present invention is that it can be used to reliably detonate at least two oppositely disposed high explosive charges.

Another advantage of the instant invention is that only half as many electrically exploded metal foil circuits need be utilized to detonate a given number of high explosive charges.

To achieve the foregoing and other objects, and in accordance with the purposes of the present invention, as embodied and broadly described herein, the apparatus of this invention may comprise a bridge element, slappers disposed on opposing sides of the bridge element, and an initiating pellet adjacent to each slapper. Opposing barrel holders and barrels, such as sapphire barrels, may be utilized to space each slapper from the high explosive it is to detonate. The invention can be utilized in line generators. Additional objects, advantages, and novel features of the invention will be set forth in part in the description which follows, and in part will become apparent to those skilled in the art upon examination of the following, or may be learned by practice of the invention. The objects and advantages of the invention may be realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and form a part of the specification, illustrate an embodiment of the present invention and, together with the description, serve to explain the principles of the invention.

In the drawings:
FIG. 1 illustrates a simple electrical circuit on a slapper base;
FIG. 2 shows the FIG. 1 circuit partially folded with a circuit insulator to be inserted into the fold;
FIG. 3 shows an exemplary bidirectional slapper detonator in an exploded view;
FIGS. 4 and 5 depict a line generator embodiment of the invention; and
FIG. 6 illustrates a line generator in accordance with the invention in an exploded view.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

With reference to FIG. 1, a copper circuit such as one comprising a layer of copper approximately 4.6 μm thick is disposed on a base or laminate of, for example, 25.4 μm thick Kapton. Kapton is a trademark of Dupont for its brand of the material polyimide. Although, for purposes of illustration, copper is shown, those skilled in the art will appreciate that other suitable conductors, such as silver and aluminum, may also be utilized. Too, although Kapton is shown as a base hereafter described, any other suitable laminate or laminate film, such as plastic films and synthetic resin polymer films, may also be used.

FIGS. 4 and 5 illustrate construction of a line generator in accordance with the invention. This invention is the result of a contract with the Department of Energy (Contract No. W-7405-ENG-36).

Slapper detonators are used to detonate high explosive charges. This invention is the result of a contract with the Department of Energy (Contract No. W-7405-ENG-36).

FIG. 1 illustrates a simple electrical circuit on a slapper base;
illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and obviously many modifications and variations are possible in light of the above teaching. The embodiment was chosen and described in order to best explain the principles of the invention and its practical application to thereby enable others skilled in the art to best utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the claims appended hereto.

We claim:
1. A bidirectional slapper detonator comprising:
   a bridge element sandwiched between two barrel holders;
   a sapphire barrel disposed in each barrel holder;
   a flyer between said bridge element and each of said barrels; and
   an initiating pellet adjacent each barrel and barrel holder.
2. A bidirectional slapper detonator comprising:
   a plurality of bridge elements disposed in a line;
   a pair of barrel holders adjacent each of said bridge elements on opposite sides thereof;
   a sapphire barrel disposed in each of said barrel holders;
   a flyer disposed between each of said bridge elements and each of said barrels; and
   an initiating pellet adjacent each of said barrels and said barrel holders.