

# United States Patent [19]

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[54] BOMBLET FUZE SYSTEM

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[51] Int. Cl.<sup>2</sup>..... F42C 13/04

[58] Field of Search..... 102/70.2 P

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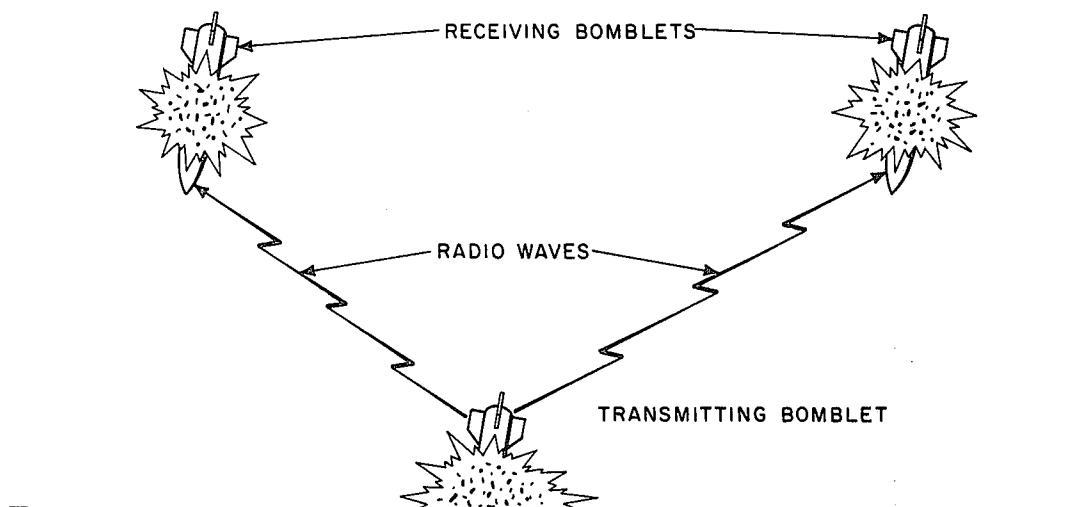
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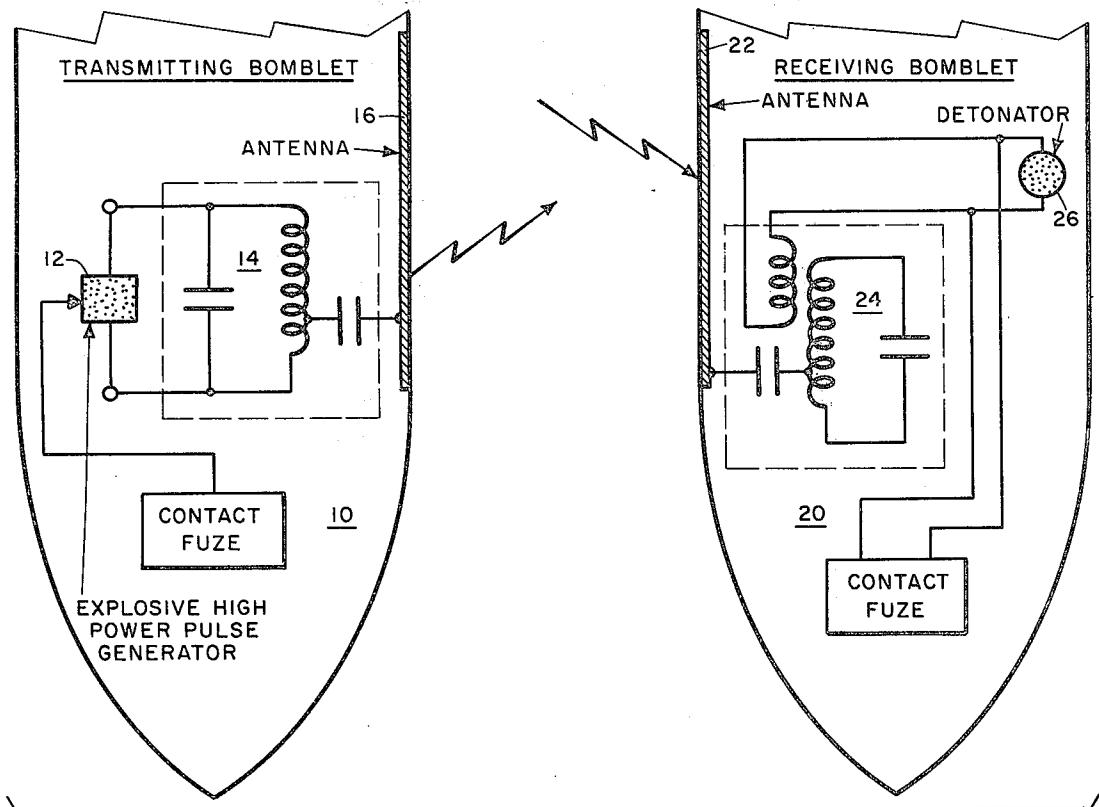
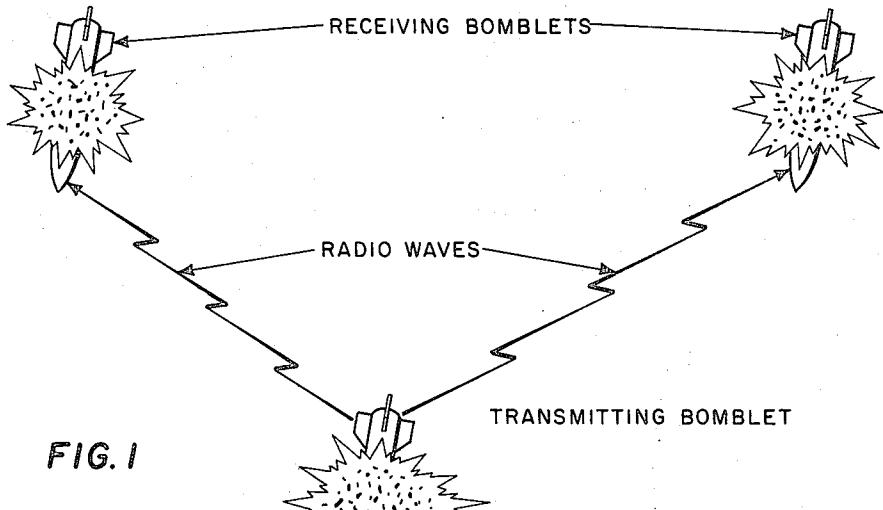
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## [57] ABSTRACT

A system for detonating a plurality of radio signal receiving bomblets dropped in a cluster together with several signal transmitting bomblets by means of explosive high power pulse generations in the transmitting bomblets.

6 Claims, 2 Drawing Figures





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**BOMBLET FUZE SYSTEM**

The invention herein described may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

At present, most bomblets have contact fuzes. Many of these bombs do not explode until they are buried in mud or soft earth and they do little damage. This is a system for detonating some of the bombs before they hit the ground, thereby increasing their effectiveness. The bombs are dropped in a group. Some 1 to 10% of the bomblets, for example, contain ferroelectric generators which, when the bomb explodes, generate a large (~ 1 megawatt) radio frequency pulse. This RF energy sets off the other bombs in the group that have not yet hit the ground by means of a very simple receiver which operates to initiate the detonator. A contact fuze initiates those bombs that hit the ground first. However, detonation of the transmitting bomblet sets off the other bomblets before they contact the ground. An object of the invention, therefore, is to provide a new fuze system to increase the effectiveness of bomblets by use of explosive ferroelectric generator means for generating a large radio frequency pulse.

Other objects and many of the attendant advantages of this invention will become readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 illustrates receiving bomblets being detonated by radio signals from an exploding transmitting bomblet.

FIG. 2 is a diagrammatic illustration of both a transmitting bomblet and receiving bomblet with appropriate circuitry.

**DESCRIPTION OF THE INVENTION**

As illustrated in FIG. 1 a transmitting bomblet, from a cluster of scattered bomblets, explodes upon contacting the ground transmitting radio signals to other bomblets containing receiving means for in turn exploding the receiving bomblets.

In this bomblet fuze system some 1 to 10%, for example, of the bomblets in each cluster are transmitting bomblets which contain explosively driven high power pulse generators. As shown in FIG. 2 transmitting bomblet 10 contains a transmitting circuit means consisting of a contact fuze 11 which initiates an explosive high power pulse generator 12 connected to a simple tank circuit 14 which in turn is connected to an antenna 16.

Explosive high power pulse generator 12 can be an explosive magnetic flux compressor which generates high current pulses, similar to that described in U.S. Pat. No. 3,484,627 or a ferroelectric explosively-driven pulse generator (transducer).

Ferroelectric explosively-driven pulse generators operate on the principle of removing the electrical remanence from a polarized material through mechanical deformation. The phenomenon whereby certain crystals exhibit a spontaneous dipole moment is called the ferroelectric effect (analogous to ferromagnetic materials which exhibit permanent magnetic moment). Piezoelectric materials such as Rochelle salt, Dihydrogen Phosphate, Barium Titanate etc. have long been known to exhibit this characteristic of spontaneous electric polarization. The ferroelectric effect seems to be due to a

5 polarization catastrophe, in which the local electric fields, due to the polarization itself, increase faster than the elastic restoring forces on the ions in the crystal; thereby leading to an asymmetrical shift in ionic positions, and hence to a permanent dipole moment.

Such explosively driven devices 12 can produce in the order of a megawatt of power for periods of the order of 10 microseconds. High power pulse generator 12 connected to tank circuit 14 and transmitting antenna 16 produces a radio frequency output which is transmitted to receiving bomblets 20.

Receiving bomblets 20 contain a receiving antenna 22, a simple receiver circuit 24, the output of which is connected to and used to fire a detonator 26. A contact fuze 28 is also connected to detonator 26 and is provided to detonate the bomblets that hit the ground prior to receiving a radio signal from a detonating transmitting bomblet.

For short ranges, the receiver 24 in bomblet 20 requires no active elements and consists of only an antenna and coupling device, as shown in FIG. 2. However, to increase the range, where a large dispersal of the bomblets is desired, a simple one or two transistor amplifier powered by a small battery can be used.

25 Where shelf-life of batteries creates a problem a capacitor which is charged sometime prior to or after dropping of the bomblets can be used. A variety of simple well known receiver circuits can be used in the receiver bomblet 20 for initiating detonator 26 upon receiving a 30 radio signal transmitted from a transmitting bomblet 10.

When a transmitting bomblet 10 hits the ground contact fuze 11 initiates the explosive high power pulse generator 12 and even if buried in mud or earth when 35 it explodes it will cause an RF pulse to be radiated. Since bomblets fall at different rates a great many receiving bomblets will still be in the air and the RF pulse will detonate these bomblets above the ground thereby increasing their effectiveness. The use of an explosive high electric power pulse generator in one bomblet to power an RF signal for initiating detonators in other bomblets eliminates many disadvantages found in proximity fuzes and similar such prior type systems.

If desired, all bomblets can contain the combination 45 of both a transmitter and a receiver so that the first bomblet to hit the ground will cause detonation of all the other bomblets.

**What is claimed is:**

1. A fuze system for bomblets dropped in a cluster to detonate a majority of the bomblets above the ground for greater effectiveness, comprising:
  - a. a greater majority of the bomblets in said cluster, each containing an RF receiver means;
  - b. a transmitter means in at least one bomblet of said cluster;
  - c. said RF receiver means comprising an antenna connected to an RF receiver, which in turn is connected to a detonator;
  - d. said transmitter means comprising a high explosive electric pulse generating means connected to an RF transmission circuit which in turn is connected to a transmitting antenna;
  - e. said high explosive electric pulse generating means being detonated by a contact fuze connected thereto;
  - f. said high explosive electric pulse generating means comprising an explosive magnetic flux compressor which produces high current pulses.

2. A fuze system as in claim 1 wherein an over-ride contact fuze is provided in each receiving bomblet connected to said detonator for initiating the bomblet if it hits the ground prior to receiving an RF signal from a transmitting bomblet.

3. A system as in claim 1 wherein each bomblet of said cluster contains both RF receiving means and transmitting means.

4. A fuze system for bomblets dropped in a cluster to detonate a majority of the bomblets above the ground for greater effectiveness, comprising:

- a. a greater majority of the bomblets in said cluster, each containing an RF receiver means;
- b. a transmitter means in at least one bomblet of said cluster;
- c. said RF receiver means comprising an antenna connected to an RF receiver, which in turn is connected to a detonator;

d. said transmitter means comprising a high explosive electric pulse generating means connected to a transmitting antenna;

e. said high explosive electric pulse generating means being detonated by a contact fuze connected thereto;

f. said high explosive pulse generating means comprising a ferroelectric explosively-driven transducer.

5. A fuze system as in claim 4 wherein an override contact fuze is provided in each receiving bomblet connected to said detonator for initiating the bomblet if it hits the ground prior to receiving an RF signal from a transmitting bomblet.

10 6. A system as in claim 4 wherein each bomblet of said cluster contains both RF receiving means and transmitting means.

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