

[54] **SENSOR-DETONATOR MODULE**

3,668,627 9/1970 Brainerd 180/103
 3,629,816 10/1970 Gillund 180/103
 3,604,356 9/1971 Browning 102/70.2 R

[75] **Inventor: Donald M. Stonestrom, West Chester, Pa.**

[73] **Assignee: ICI America Inc., Wilmington, Del.**

Primary Examiner—Benjamin A. Borchelt

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Assistant Examiner—J. V. Doramus

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Attorney—Kenneth E. Mulford and Roger R. Horton

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[58] **Field of Search** 102/70.2 R; 200/61.45; 180/103, 91; 280/150 AB; 220/2.1, 2.2, 67; 206/30

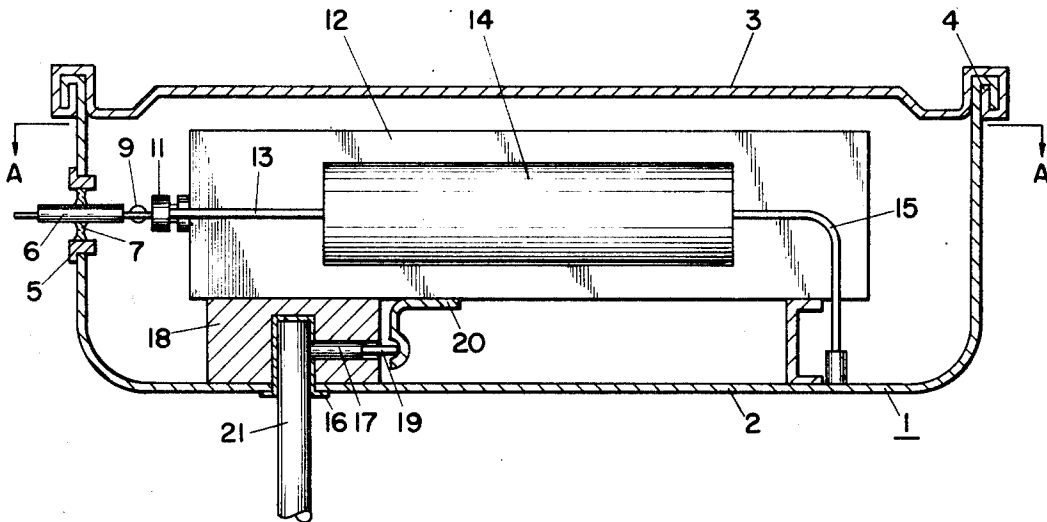
[57] **ABSTRACT**

A sensor-detonator module for sensing a change in motion and electrically firing a detonator in response thereto. The sensor and detonator are sealed within a can. An insulated pin passes through the can to connect to a source of electricity. A capacitor and a diode may be provided to insure the firing of the detonator even though the circuit to the electrical source is broken or shorted.

[56] **References Cited**
UNITED STATES PATENTS

3,647,999 7/1970 Mazelsky 200/61.45

6 Claims, 3 Drawing Figures



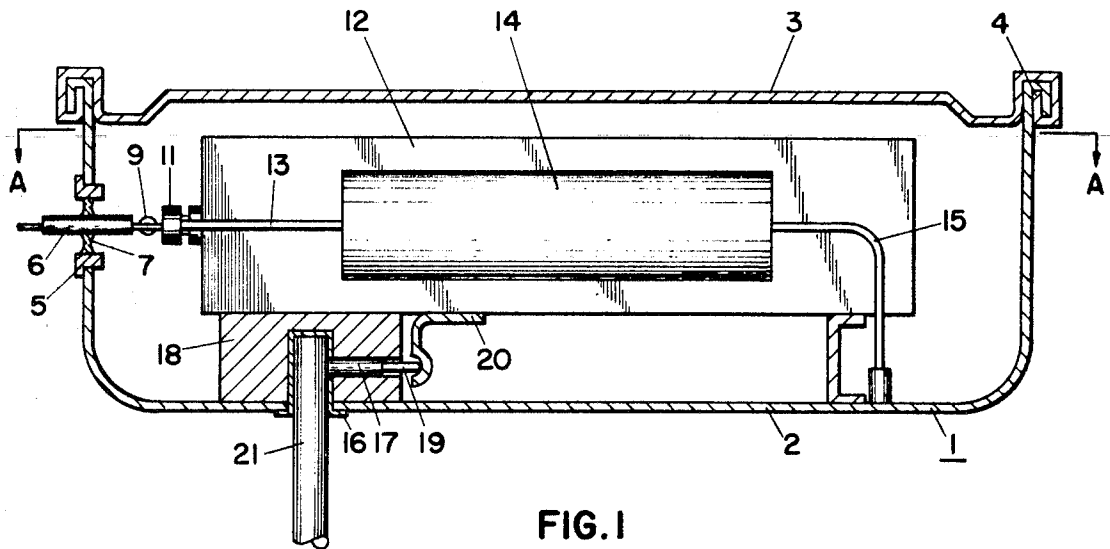


FIG. 1

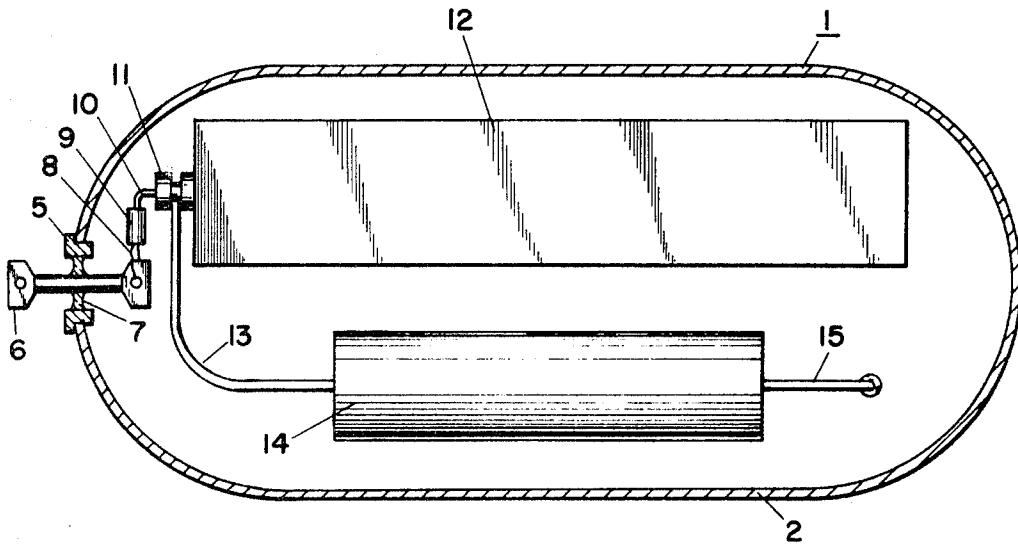


FIG. 2

INVENTOR

Donald M. Stonestrom

BY *Richard D. Fuerle*

ATTORNEY

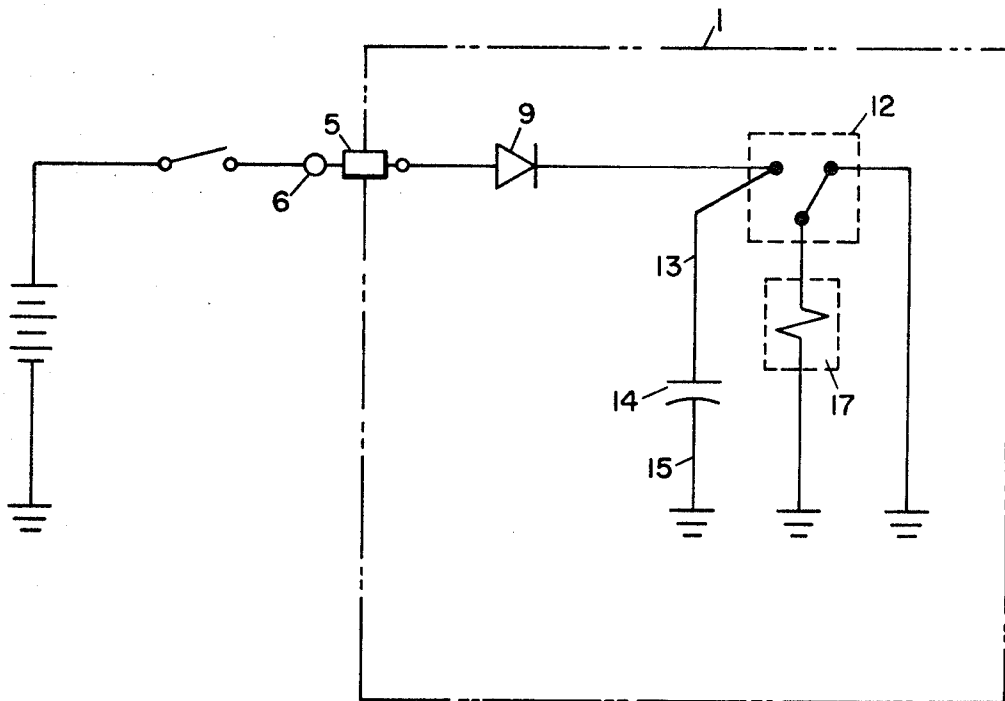


FIG. 3

SENSOR-DETONATOR MODULE

The inflatable air bag is a new safety device for protecting automobile passengers in a collision. When the automobile strikes something or is struck by something, a sensor detects the change in motion and closes a switch. This fires a detonator which releases gas under high pressure from a bottle into a folded bag. The bag expands in front of the passenger and prevents him from striking the dashboard. See U. S. Pat. No. 3,485,973.

I have invented a module which contains both the detonator and the sensor and which is completely sealed so as to protect them from dust, dirt, moisture, and humidity. An insulated pin passes through the can to carry electricity to the detonator. Since the module has a metal can, the detonator is protected from static electricity and radio frequency radiation. There are no loose wires connecting the sensor and the detonator which could be broken to prevent the device from functioning or which, if external, could permit a person not familiar with the device, such as a child, to inadvertently make a connection which would fire the detonator. The module also significantly reduces the hazard of accidental firing since the sensor and detonator have been pre-wired.

A capacitor may be provided inside the module so that the detonator can be fired from the electricity stored in the capacitor even though the external connection to an electrical source may have been broken. A diode may also be included inside the module to prevent drainage of the capacitor should the connection to the electrical source become shorted.

The accompanying drawings illustrate a certain presently preferred embodiment of my invention.

FIG. 1 is a side view in section of a certain presently preferred embodiment of the module of this invention.

FIG. 2 is a plan view of the module of FIG. 1 through section A—A.

FIG. 3 is a circuit diagram showing the firing circuit employed in FIGS. 1 and 2.

In FIGS. 1 and 2, a can 1 is formed from a cup portion 2 and a lid 3 which is rolled over the cup portion at 4 to provide a seal. A metal ring 5 is welded to the can and holds metal pin 6 within glass seal 7. Pin 6 is connected by wire 8 to diode 9. The diode is connected by wire 10 to terminal 11 of sensor 12.

The sensor is a device well known to the art which detects a change in motion, that is, an acceleration or deceleration greater than a predetermined minimum amount, and closes a switch in response to the detected change. The sensor may detect a change in motion in one direction, or preferably in all directions as in an omnidirectional switch. See, for example, U. S. Pat. No. 3,457,382.

Also connected to terminal 11 is wire 13 which leads to capacitor 14. Another wire 15 connects the capacitor to the can which is grounded.

A well 16 in the can is provided for the insertion of a linear shaped charge 21, a well-known form of explosive which is used to fracture a bottle of compressed gas (not shown) which inflates the air bag. Adjacent the well is a detonator 17 held by metallic support 18. The detonator is commercially available and is electrically activated. It is fired by sending a current through its shell and pin 19. Terminal strip 20 holds the detonator in place and connects pin 19 to one side of the switch in the sensor, terminal 11 being connected to the other side.

An electric current is supplied to pin 6 and can 1. If the module is subjected to an acceleration or deceleration in the proper direction and greater than a preset minimum amount, the switch in the sensor will be closed and current will flow from pin 6 to wire 8 through diode 9, wire 10, and terminal 11 to the switch in the sensor then through terminal strip 20 and pin 19 into detonator 17 to can 1 to ground thereby firing the detonator and linear shaped charge 21.

The current also flows from terminal 11 through wire 13 to capacitor 14 through wire 15 to can 1 to ground thereby charging the capacitor. If an accident severs the electrical connection to pin 6, capacitor 14 will, for a few seconds, supply enough electrical energy to fire the detonator. If the accident shorts pin 6 to ground, the capacitor will not be shorted since diode 9 prevents current from flowing back to pin 6 from terminal 11.

What is claimed is:

1. A sensor-detonator module comprising:

- a. a sealed metal can having a metal pin passing therethrough in sealed insulated relationship therewith;
- b. an electrically activated detonator inside said can, said detonator having two electrical terminals, one of which is electrically connected to said can; and
- c. a sensor inside said can for detecting a change in motion and for closing a switch in response thereto, said switch having a first and a second terminal, said first terminal being electrically connected to said pin and said second terminal being electrically connected to the terminal of said detonator which is not electrically connected to said can.

2. A module according to claim 1 wherein said pin is sealed to said can by a glass seal.

3. A module according to claim 1 wherein said can has a well for a linear shaped charge adjacent said detonator.

4. A module according to claim 1 wherein said sensor is an omnidirectional switch.

5. A module according to claim 1 wherein a capacitor is electrically connected to said can and to said first terminal.

6. A module according to claim 5 wherein a diode is electrically connected in series between said pin and said first terminal.

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