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- [54] AIRPLANE CRASH LOCATING DEVICE 3,102,982 9/1963 Stypulkowski et al. 325/112
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[51] Int. Cl. H04b 1/02

[58] Field of Search 325/111-115,
325/119, 105; 343/702, 705

[56] References Cited

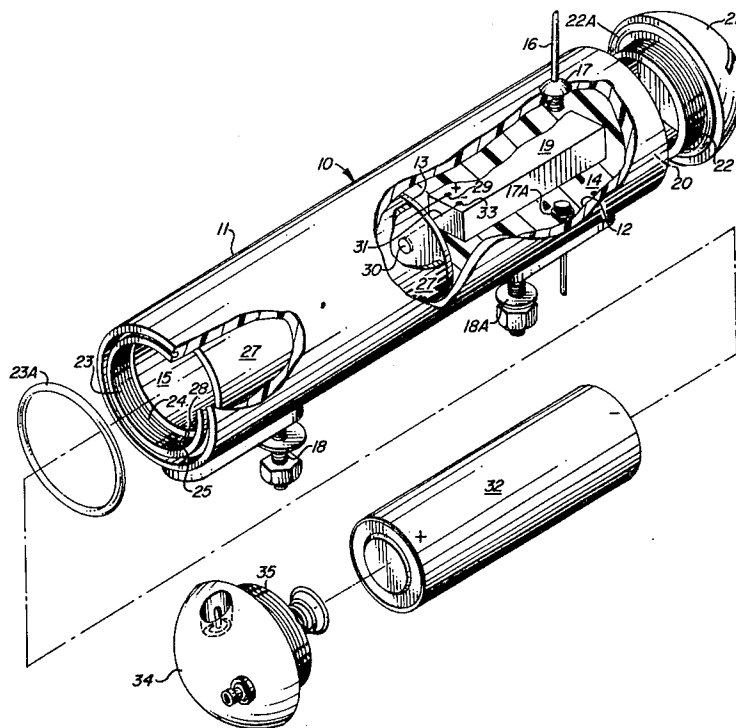
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[57] ABSTRACT

An impact energized airplane crash locating device comprising an elongated cylindrical glass filled polycarbonate plastic housing surrounding a transmitter and power supply retained within the central portion of the housing accessible through threadedly attached end covers of the unit. One end cap is provided with manual and novel impact controlled switched selectively operable while the other end cap provides access to the transmitter. An antenna is selectively mounted on the outside of the housing or at a distance therefrom.

7 Claims, 7 Drawing Figures



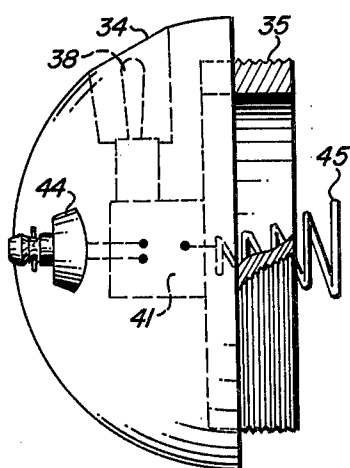
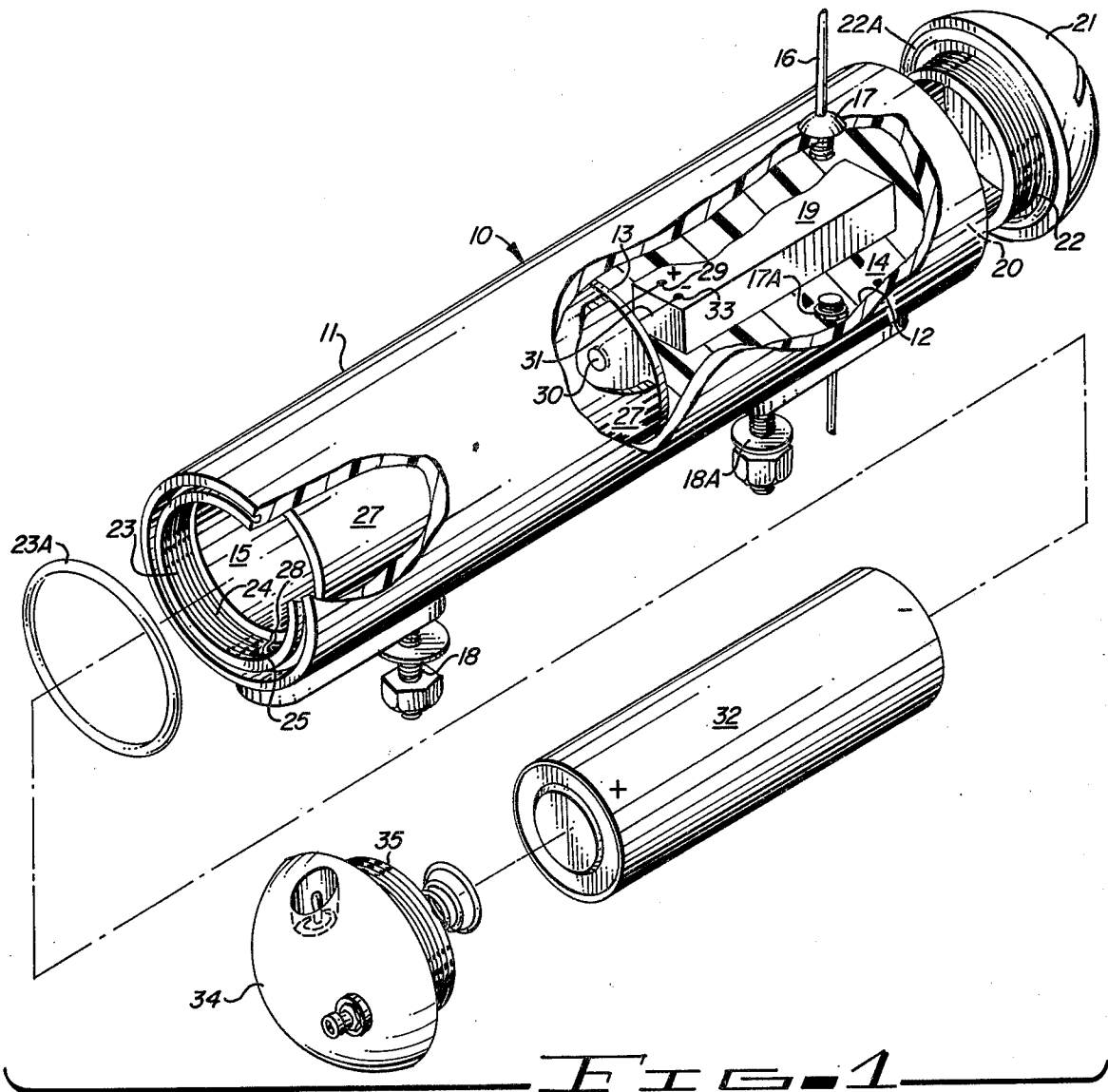


FIG. 2

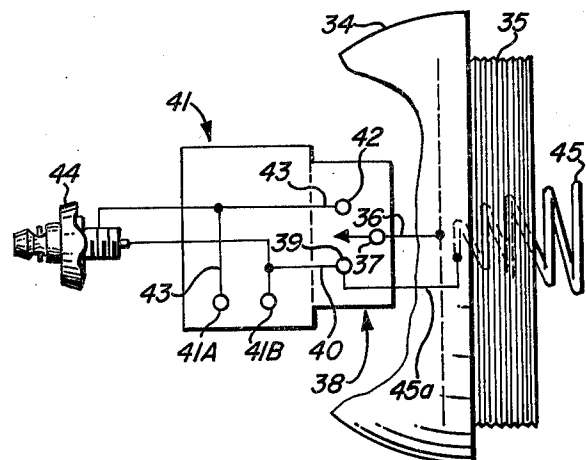


FIG. 3

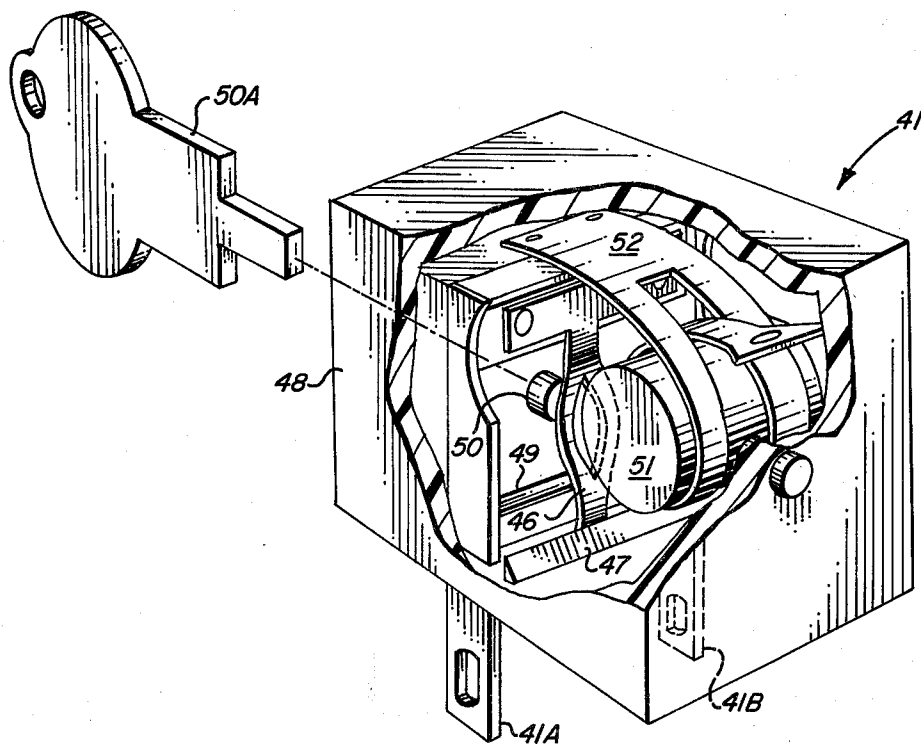
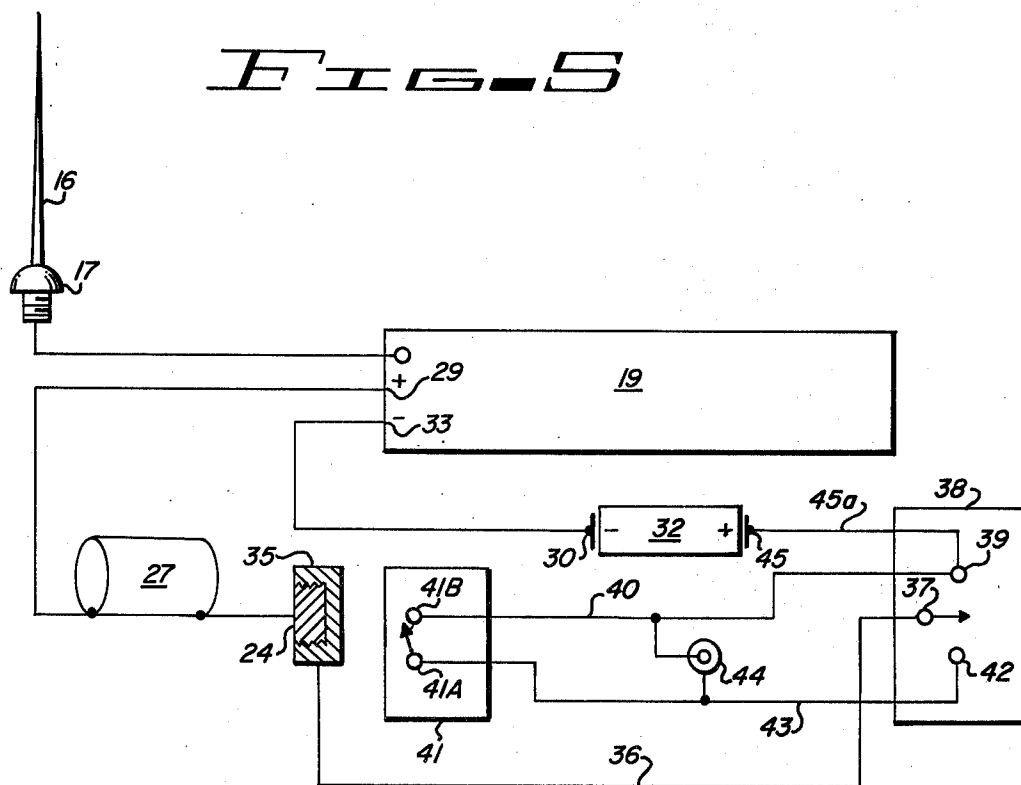


FIG. 4

FIG. 5



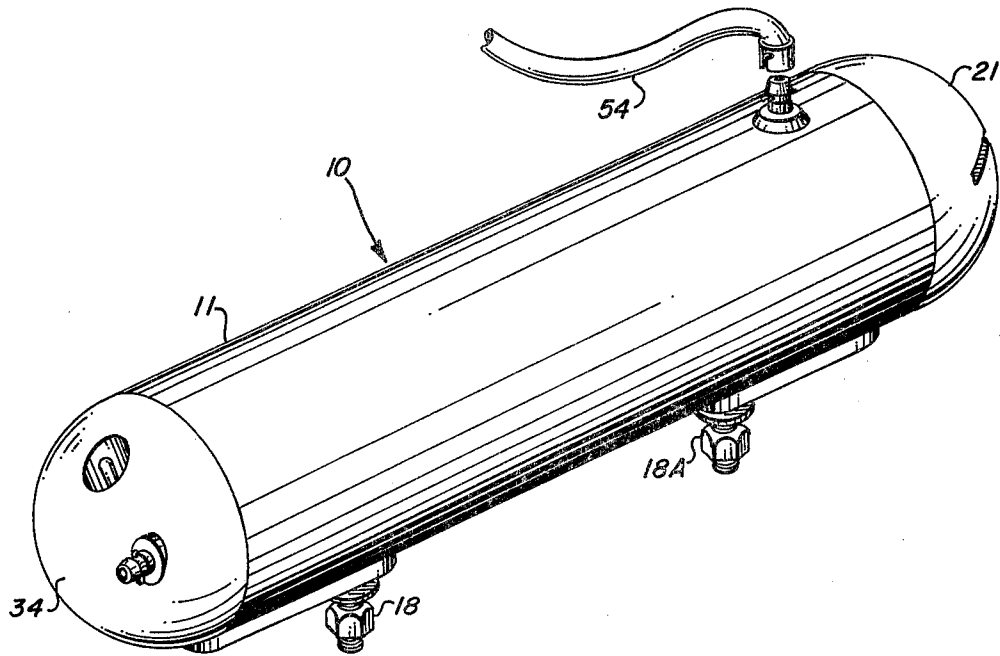


FIG. 6

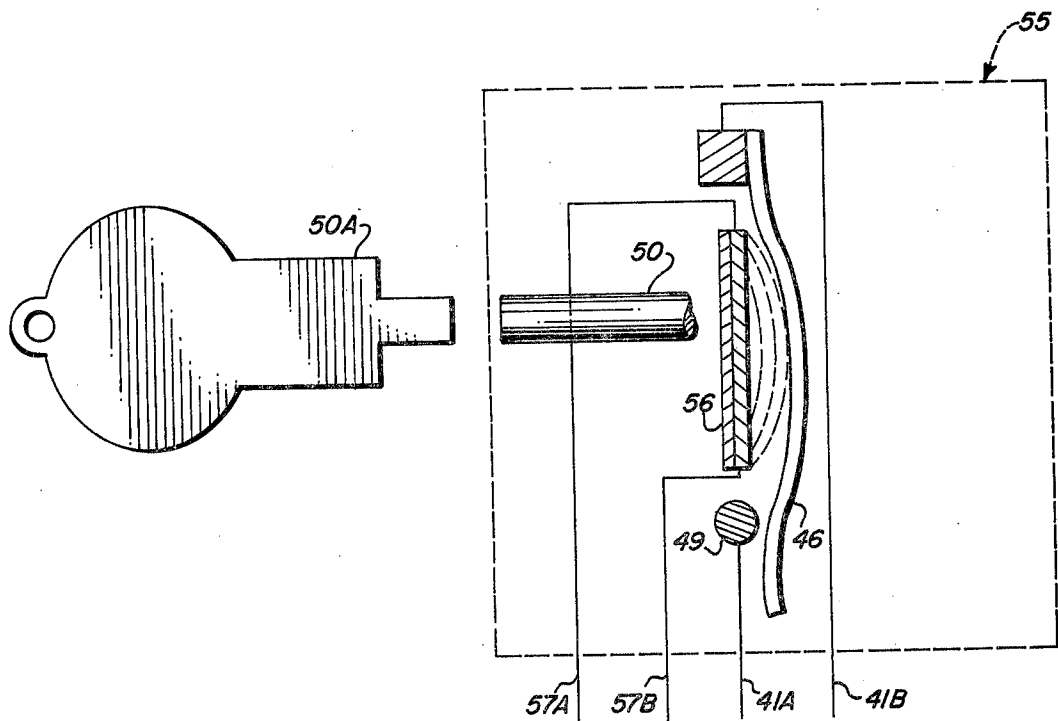


FIG. 7

AIRPLANE CRASH LOCATING DEVICE

BACKGROUND OF THE INVENTION

This invention pertains to apparatus for automatically sending information as to the position of an aircraft upon its forced landing, collision or crack-up, and is particularly directed to an airplane crash locator transmitter with novel impact switch and an antenna detachably mounted on the outside of the housing at the transmitter end thereof or at a point remote therefrom.

Heretofore, devices of the above type failed to deploy themselves efficiently and in proper operative condition so that the radio distress signals could be promptly and clearly picked up. The former devices lacked durability on impact to prevent damage to the transmitter and entanglement with the plane and ground objects at the time of the crash and were also complex and costly so that they could not be used in small, inexpensive planes.

SUMMARY OF THE INVENTION

In accordance with the invention claimed an improved airplane locating device is provided for forced landing or crash location identification purposes.

It is, therefore, one object of this invention to provide an improved device for locating a downed aircraft.

Another object of this invention is to provide apparatus for identifying a plane crash or forced landing site and thereby reducing the length of time required to find the airplane.

A further object of this invention is to provide an immediate radio signal on a given frequency at the moment of impact through the functioning of a novel impact switch.

A still further object of this invention is to provide a crash locator transmitter that is small, light in weight and requires very little maintenance over long periods of time.

A still further object of this invention is to provide a crash locating device having a glass filled polycarbonate aerodynamic shaped plastic housing with an antenna detachably located on the housing at a point remote thereof which housing surrounding the transmitter and power pack has high durability and impact strength and is fully weatherproof for all adverse operating conditions.

Further objects and advantages of the invention will become apparent as the following description proceeds and the features of novelty which characterize this invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention may be more readily described by reference to the accompanying drawing in which:

FIG. 1 is an exploded partially broken away perspective view of the airplane crash locating device incorporating the features of this invention;

FIG. 2 is an enlarged side view partially broken away of the left end cap shown in FIG. 1;

FIG. 3 is a partial view of FIG. 2 showing more details of the circuitry shown therein;

FIG. 4 illustrates more detail of the impact switch shown in FIGS. 2 and 3;

FIG. 5 illustrates schematically the circuitry embodied in the airplane crash locating device shown in FIG. 1;

FIG. 6 is a view of the airplane crash locating device employing a remote terminal, and

FIG. 7 is a modification of the impact switch shown in FIG. 4 embodying an automatic reset feature.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings by characters of reference, FIG. 1 illustrates an airplane crash locating device 10 comprising a main cylindrical housing 11 of suitable glass filled polycarbonate plastic or the like having a bore 12 divided by a baffle 13 to provide a transmitter compartment 14 and a battery compartment 15. An antenna 16 comprising a single piece or telescopic rod configuration is arranged to be detachably threadedly connected to housing 11 by connectors 17 or 17A. Connector 17A is arranged in housing 11 adjacent mounting bolts 18, 18A. Antenna 16 is connected through connectors 17 or 17A to suitable terminals (not shown) in the transmitter compartment 14 for appropriate connection to a transmitter 19 in the usual manner. The transmitter is placed in compartment 14 and encased in foam plastic through the threaded access opening 20 in which is demountably threaded the hemispherical closure cap 21 by its threaded hub 22 and sealed by an O-ring 22A.

If so desired the antenna may be remotely located from device 10. As shown in FIG. 6 this may be accomplished by a coaxial cable 54 connected at one end to the antenna (not shown) and at the other end to connector 17.

The threaded access opening 23 of the battery compartment 15 comprises an imbedded electroconductive ring 24 connected through a conductor 25 to a metallic cylindrical sleeve 27 at point 28. Sleeve 27 is connected at its opposite end to the positive power terminal 29 of the transmitter 19. In the baffle 13 is the negative battery contact 30 connecting conductor 31 and the negative terminal of a battery 32 to the negative terminal 33 of the transmitter in compartment 14.

The battery compartment 15 has a hemispherical closure cap 34 having an electroconductive threaded hub 35 matingly fitting the electroconductive threaded access opening 23 and sealed by an O-ring 23A. The threaded hub is connected by a conductor 36 (shown in FIG. 3) to terminal 37 of a manually operated three way toggle switch 38. A second terminal 39 of switch 38 is connected through a conductor 40 to terminal 41B of an impact operated switch 41 in the closure cap 34 and through a conductor 45A to coil spring 45 contacting the positive terminal of battery 32. The other terminal 42 of switch 38 is connected through conductors 43 to terminal 41A of impact switch 41.

For test or emergency purposes, a remote connector 44 for a remote switch (not shown) is provided across the terminals 41A and 41B of the impact operated switch 41. Severance of the remote connector in the event of a crash will not prevent device 10 from operating.

FIG. 4 illustrates a view of a known impact switch offered to the market by Technor Incorporated and sold by them as an Acceleration Switch.

This switch as disclosed herein as impact switch 41 comprises two normally separated terminals 41A and

41B. Terminal 41A is electrically connected to a leaf spring 46 fixedly connected at one end to terminal 41A and loosely retained at its other end by an insulating ridge 47 in the hollow insulating housing 48 of the switch. Juxtapositioned to the other end of the leaf spring 46 is a conductive bar 49 which is electrically connected to terminal 41B. By inserting a key 50A in hole 50 in housing 48, spring 46 may be pushed and deflected away from bar 49 so as to break the electrical connection between terminals 41A and 41B.

In order to deflect spring 46 to cause it to engage and make electrical contact with bar 49, a roller 51 is coiled in a resilient metal strap 52 with one end of strap 52 attached to housing 48, as shown, and the other end attached to roller 51. Under given impact forces, such as during a crash landing of the plane, roller 51 will unroll strap 52 causing the roller to engage the deflect spring 46 which was previously set to that position by key 50A inserted through hole 50. This roller action caused by the impact deflects spring 46 against the bar 49 completing an electric circuit through impact switch 41.

If switch 41 is to be reset it is merely necessary to reinsert the key in hole 50 and force the leaf spring 46 to deflect away from roller 51, thereby breaking the electrical connection between terminals 41A and 41B.

FIG. 7 illustrates a modification of the impact switch 41 shown in FIG. 4 wherein the same elements are given the same reference characters. The impact switch 55 shown in FIG. 7 differs from that shown in FIG. 4 by the additional means for electrically opening the switch after closure. This means is shown as a bimetallic element 56 which is distorted by a flow of current therethrough in the well known manner, causing it to deflect and move the leaf spring 46 to its open circuit position.

Thus, at a remote spot such as the cockpit of the plane the impact switch may be opened by causing current to flow through conductors 57A and 57B and the bimetallic element. Impact switch 55 also contains the usual key 50A for manually closing the switch as heretofore explained.

FIG. 5 illustrates schematically the circuits embodied in the locating device 10 and will be helpful in understanding the operation of the device.

Operation

The above described unit is provided with a transmitter designed to provide automatic modulation of a downswep tone within the limits of 1,600 Hz and 300 Hz and sweeping a minimum range of 700 Hz at a rate of sweep of 2 to 4 Hz per second. This modulation is superimposed on a dual VHF carrier operating at 121.5 MHz and 243.0 MHz simultaneously.

Modulation is in the form of a non-symmetrical rectangular wave which gates the transmitter chain of pulses on and off at a predetermined duty cycle. Index of modulation is 100 percent which results in an equivalent to a pulse duration modulation (PDM) system.

The modulator circuitry consists of a voltage controlled multivibrator and a carrier modulation gate circuit. The ramp sweep control to drive the multivibrator is generated by a unijunction oscillator.

The transmitter chain includes a temperature stabilized crystal controlled oscillator operating at 121.5 MHz, times two frequency multiplier and power amplifier with associated output filter providing impedance matching to the monopole antenna system and suppression of unwanted harmonics.

The radiation pattern is omnidirectional.

The airplane crash locating device may be manually energized by actuating the toggle switch 38 to connect the switch arm 37 to terminal 42. This action energizes the transmitter causing it to generate and transmit uniform signal pulses.

If the toggle switch is set on automatic which means that the toggle switch arm 37 is engaging terminal 39 of switch 38, the transmitter will remain deenergized until a predetermined impact force closes impact switch 41. Switch 41 is of the well known type which under given gravitational forces closes its contacts. Since the toggle switch 38 has been set to automatic action upon the closing of the impact switch, the transmitter then is energized and generates a series of signal pulses.

Since the housing of the airplane locating device is formed of glass filled polycarbonate plastic, it will withstand a drop of 800 feet or more on to a hard surface such as desert terrain and it may be submerged in water or enveloped in gasoline flames of 3000° Fahrenheit. It is self contained in an aerodynamic torpedo shaped housing and can be bolted on board an airplane in minutes internally or externally of its fuselage and can be manually activated or automatically activated by crash forces.

A number of different transmitting devices may be used, however; they should be of a solid state and hermetically sealed type to stand the impact forces necessary for this type of device.

Although but one embodiment of the present invention has been illustrated and described, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

What is claimed is:

1. An airplane locating device comprising:

an open ended cylindrical housing having an axially disposed bore,

demountable closure caps one for attaching to each end of said housing,

a radially disposed baffle in said bore to provide a transmitter compartment at one end of the housing and a battery compartment at the other end of the housing,

a radiation antenna attached to the outer circumference of the housing at the transmitter compartment end thereof,

switching means mounted in one of said caps for selectively connecting a battery placed in said battery compartment with a transmitter placed in said transmitter compartment,

said switching means comprising a selector switch and an impact switch,

said selector switch in one position directly connecting the battery in said battery compartment to the transmitter in said transmitter compartment and when in another position connecting the battery through said impact switch to the transmitter, said impact switch upon closure under given impact forces energizing the transmitter, and

electrical means for opening said impact switch,

2. The airplane locating device set forth in claim 1 wherein:

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said impact switch is provided with both mechanical and electrical means for individually opening its contacts.

3. The airplane locating device set forth in claim 1 wherein:

said electrical means comprises a bimetallic element.

4. The airplane locating device set forth in claim 1 wherein:

said antenna is remotely positioned relative to said housing.

5. The airplane locating device set forth in claim 1 wherein:

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said housing is formed from a glass impregnated polycarbonate plastic of high durability and impact strength.

6. The airplane locating device set forth in claim 1 wherein:

said switching means is mounted in said cap on the battery end of said housing.

7. The airplane locating device set forth in claim 1 in further combination with:

means for short circuiting said impact switch for test purposes for energizing said transmitter.

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