

United State

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[15] 3,676,779

[45] July 11, 1972

[54] SIGNAL DEVICE

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[22] Filed: May 26, 1970

[21] Appl. No.: 40,561

[52] U.S. Cl. 325/115

[51] Int. Cl. H04b 1/02

[58] Field of Search 244/2; 46/145, 146; 116/124 B,
116/114 AH; 325/115; 221/295, 297

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[57]

ABSTRACT

A balloon package is folded onto an ejection platform which becomes propelled outwardly from an enclosure. A gas cartridge inflates the balloon as the latter is ejected from the enclosure causing the balloon's inflation. A radio transmitter attached to the balloon is actuated when the balloon is ejected so that a coded radio signal can issue forth from the location of the balloon. Manual and automatic trigger means are provided for ejecting the balloon.

2 Claims, 5 Drawing Figures



NO RADIO

116-
INDICATOR

Fig. 1

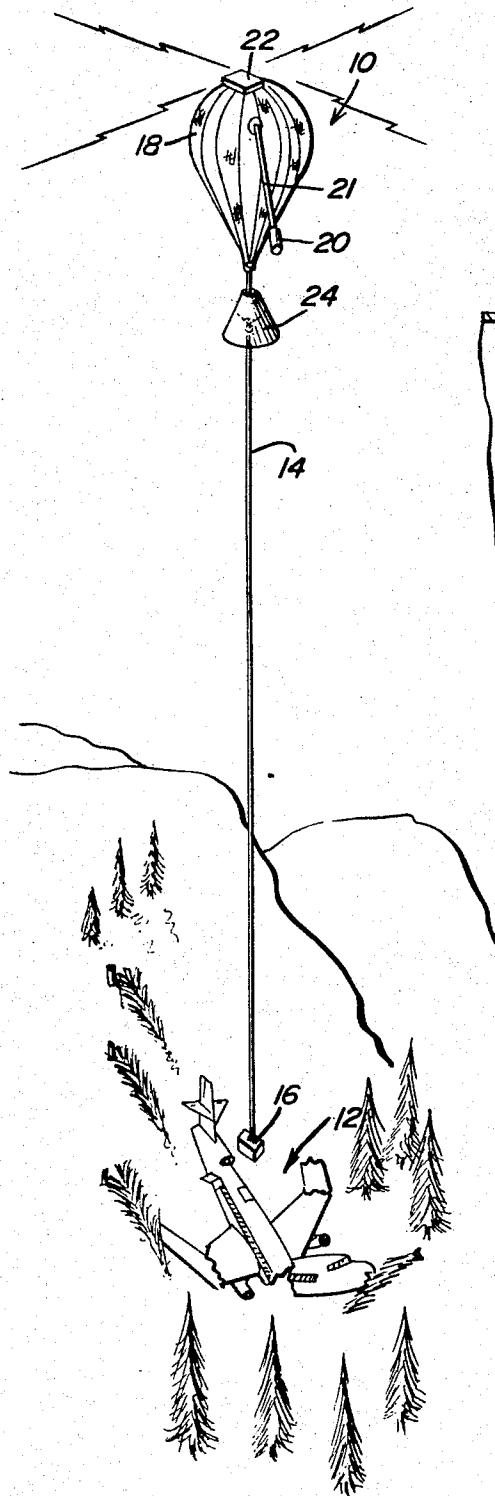


Fig. 2

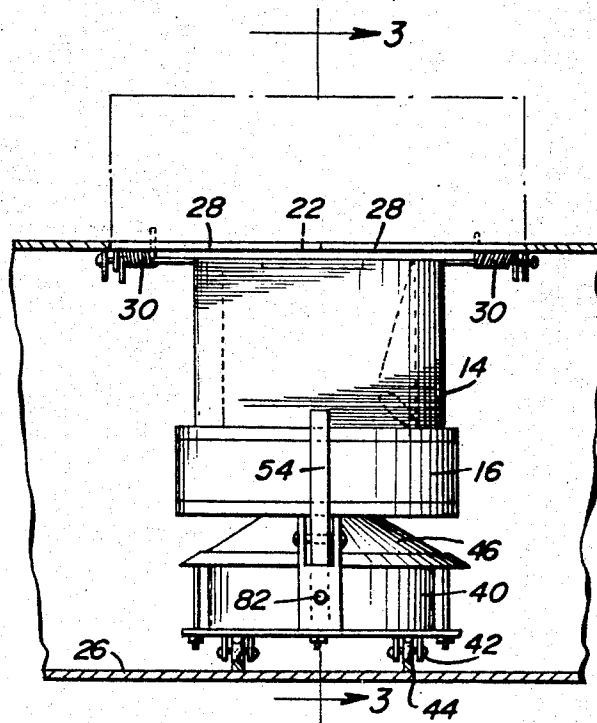
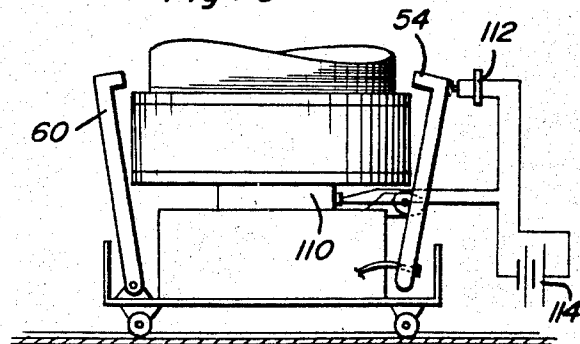


Fig. 5



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Fig. 3

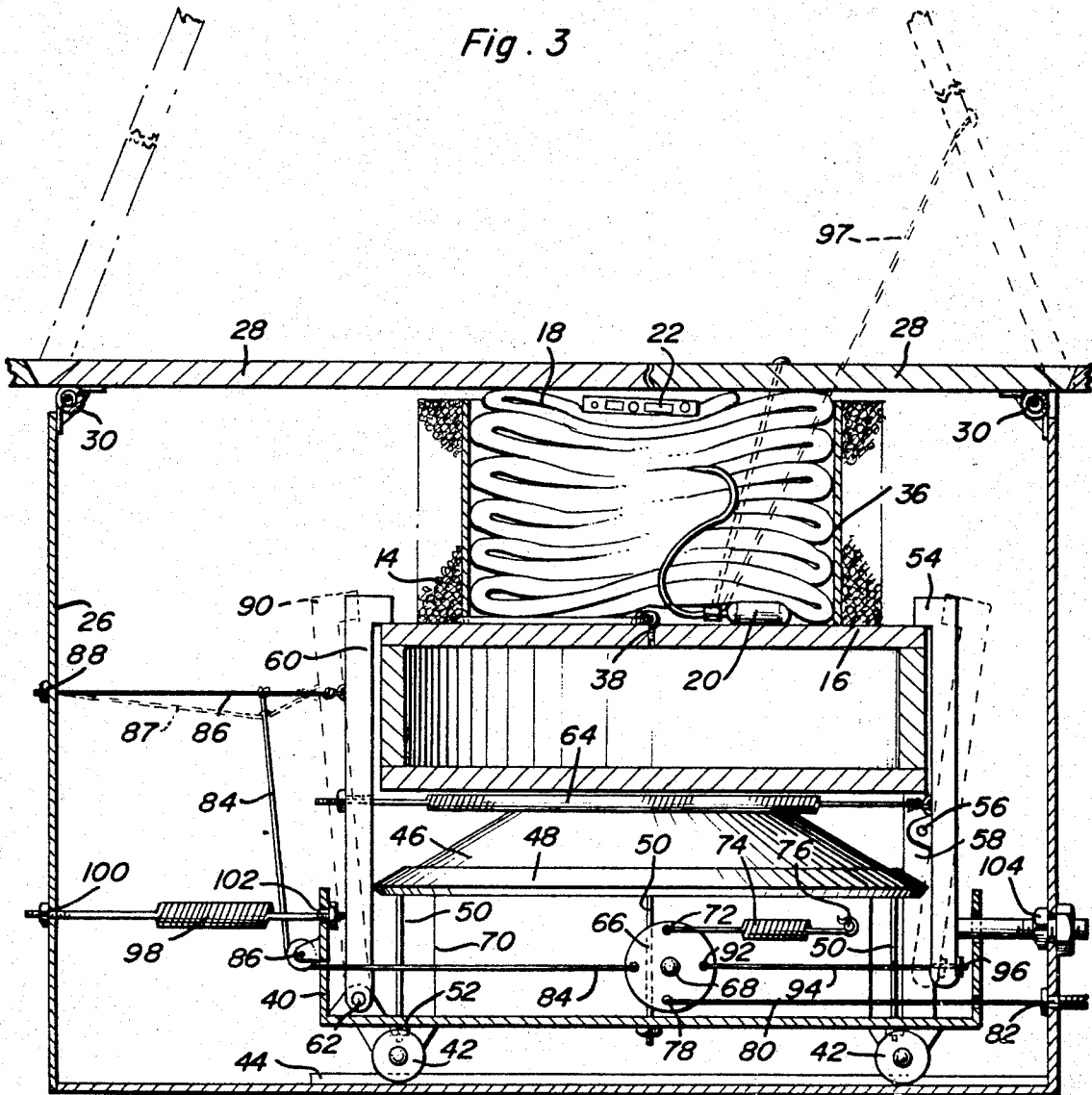
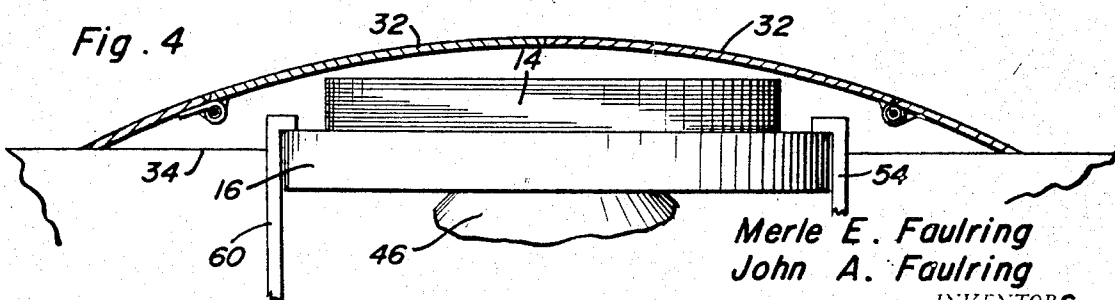


Fig. 4



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SIGNAL DEVICE

The present invention relates to signal devices for alerting air and sea monitors of an emergency situation.

In the past, a great number of air and sea craft have been lost due to inadequate alarm signalling devices. Certain prior art solutions include manual equipment for sending flares or other visual indications of distress. As will be appreciated, these are useless if the craft crew is disabled. Certain other attempts to solve the problem include provision for an emergency radio transmitter on the craft which allows search parties to triangulate on the generated radio signal until the lost craft is found. However, the triangulation process is time consuming and therefore may prevent rapid assistance to injured individuals.

The present invention is directed to a signalling device in the form of an inflatable balloon which is adapted to float in the immediate area of a lost craft. A radio transmitter is attached to the balloon which allows rough triangulation. The presence of the balloon permits search parties to spot the location of the lost craft from miles around so that precious time can be eliminated for pinpoint location.

The present invention includes a manually actuated trigger for pressing the signal device into operation. Also, an automatic impact responsive trigger means is provided for releasing the signal device when the crew of the craft would be unable to do so by themselves. Accordingly, the present invention involves both visual and radio signal devices that can be deployed manually and automatically so that maximum response to distress signalling can be realized.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a pictorial view illustrating the utilization of the present invention in the environment of a downed aircraft.

FIG. 2 is a side elevational view of the present device as located within the fuselage of an aircraft.

FIG. 3 is a transverse sectional view taken along a plane passing through section line 3—3 of FIG. 2 disclosing the components of the present invention.

FIG. 4 is a modified form of the invention illustrating the mounting of the present invention within a bubble top enclosure.

FIG. 5 is another form of the invention illustrating a dynamite charge for ejecting a signal balloon.

Although the following description of the present invention will be described in terms of an aircraft, as will be appreciated, the design and principles of the invention can be equally applied to water craft and land vehicles.

Referring to FIG. 1, visual and radio components of the present invention are generally indicated by the reference numeral 10, these components being manually or automatically ejected from a distressed aircraft 12. In the automatic mode, when a properly equipped aircraft crashes, the resultant shock causes automatic ejection of the indicator assembly 10. A vertically extended line 14 is anchored at the bottom end 16 so that the indicator assembly 10 remains in the immediate vicinity of the aircraft 12. A teardrop shaped balloon 18 is connected at the opposite end of line 14 and is inflated by a gas cartridge 20 connected to the upper end of the balloon via a flexible fill tube 21. This placement of the tube with respect to the balloon ensures that the top of the balloon fills first and prevents fouling of the line during ejection. The balloon is to be colored with orange and white stripes to indicate the universally accepted code for distress. A radio transmitter 22 having a self-contained power supply is attached to the top of balloon 18 to facilitate servicing while stored and begins generating a coded radio signal when the balloon 18 is ejected from the aircraft. It is preferable to connect an insulated cone 24 to the bottom of the balloon while the top of line 24 is attached to the cone. The insulated cone prevents the line from acting as a ground for the transmitter when lightning strikes and the line is wet from rain.

With this brief introduction to the invention, reference is made to FIGS. 2 and 3 which illustrate the disposition of the present invention within the fuselage of an aircraft. While in this normal position, the balloon 18 is deflated and the line is folded into a compact package. The base and side walls 26 of the aircraft fuselage serve as a housing for the present signal device. Coextensive flap doors 28 cover the housing and are mounted to hinges 30 which allow the doors to open when ejection of the signal device occurs. In aircraft having sufficient space within the fuselage, the flat planar doors 28 are preferable. However, where space within the fuselage is somewhat limited, arcuate or spherical mating doors 32 can be employed to create a bubble top projection from the fuselage exterior 34 as shown in FIG. 4.

FIG. 3 illustrates the location of components within the fuselage housing and will be seen to include the balloon 18 compactly folded upon the box 16, the latter serving as an anchor or flotation member after ejection of the balloon from its enclosure. A cylindrical spool 36 sits atop box 16 and forms a core for the tightly wound line 14 having a first end thereof attached to the balloon while the opposite end is fastened to the box 16 by a suitable fastener 38. The umbrella shaped shield 24 (FIG. 1) is normally collapsed and entwined with the wound line 14 therefore requiring the fabrication of shield 24 from flexible material.

The signal device is carried upon a carriage base 40 which in turn is mounted upon rollers or wheels 42. The wheels are adapted for engagement with a rail section 44 thereby allowing the carriage 40 to undergo displacement in a particular direction when the aircraft crashes. This aspect of the invention will be explained hereinafter.

A frusto-conical resilient member 46 serving as a spring is positioned in underlying contact with the underside of box 16. This spring is normally biased to allow outward ejection of the balloon 18 and attached box 16 when the housing doors 28 are opened. A beveled ring 48 engages the lower circumference of the frusto-conical spring 46, the ring being held in place by parallel spaced vertically disposed bolts 50 that are themselves anchored to the carriage 40 by suitable nuts 52.

A vertically positioned hold-down arm 54 is pivotally mounted at 56 to a vertical bracket member 58 secured to the carriage 40. The hold-down arm 54 has a projecting flange at the upper end thereof which engages the upper surface of box 16 and holds the box in biasing engagement with the frusto-conical spring 46. A second hold-down arm 60 identical to the first 54 is pivotally mounted at the lower end thereof (62) to carriage 40. The latter mentioned arm serves the same purpose as arm 54. A coil spring 64 bridges intermediate points of hold-down arms 54 and 60 to urge the hold-down arms in engagement with the box 16.

The actuation mechanism for the present invention will now be dealt with. As will be seen in FIG. 3, a disc 66 serving as a cam is pivotally mounted at the center thereof (68) to a cylindrical shell 70 positioned beneath the frusto-conical spring 46. The disc 66 includes a first aperture 72 which serves as a mounting hole for the first end of a coil spring 74, the opposite end of the spring being fastened to a pin 76 projecting from the wall of the cylindrical shell 70. The spring offsets the tension of an actuation trip line 80 that is attached at the inner end thereof to an aperture 78 formed diametrically opposite the aforementioned aperture 72 in disc 66. Normally, the tension of trip line 80 is equal to the tension produced by coil spring 74 so that the disc 66 remains in equilibrium. The intermediate section of trip line 80 passes through a grommet 82 and terminates at an opposite end (not shown) in the cockpit of the aircraft thereby enabling manual actuation by a crew member when a crash condition is anticipated. By pulling on the trip line 80, the disc 66 is caused to rotate counterclockwise thereby causing pulling displacement of the line 84 connected at the inner end thereof to an aperture in quadrature with the apertures 72 and 78 of disc 66. An intermediate point of line 84 passes across a pulley wheel 86 that is fixed to carriage 40. The opposite end of line 84 is connected to an intermediate point of another line section 86 connected

between the housing wall (88) and an upper point on hold-down arm 60. Thus, when disc 66 is rotated counterclockwise in response to pulling of trip line 80, line 86 is caused to assume its deflected position shown in phantom and indicated by 87. When this deflection occurs, a pulling force is exerted on hold-down arm 60 resulting in its disengagement from the box 16 as shown in phantom and denoted by 90. In order to obtain disengagement between hold-down arm 54 and box 16, an aperture 92 in quadrature with the aforementioned apertures 72 and 78 in disc 66 connects the first end of a line 94 having its opposite end 96 fixed to the lower end of hold-down arm 54. Thus, when disc 66 undergoes counterclockwise rotation, line 94 will be pulled inwardly toward disc 66 resulting in the outward displacement and disengagement of hold-down arm 54 from box 16.

When the hold-down arms are free of the box 16, the compressed frusto-conical spring 46 propels the box 16 and the device components mounted on the top thereof against the closed biased doors 28. The propelling forces are sufficient to open the doors as indicated in phantom and eject the signal device package outwardly for a distance approximating 20 feet. In order to cause inflation of balloon 18, a trip cord 97 is connected between one of the doors 28 and the valve of gas cartridge 20. When the doors are forced open by outward ejection of the signal device, the balloon 18 is quickly inflated as it undergoes ejection. In a preferred embodiment of the invention, a spring biased switch (not shown) projecting from transmitter 22 engages the top side of the box 16. Thus, when inflation of balloon 18 occurs, separation between the balloon 18 and the box 16 results. This separation causes the transmitter switch to be turned on so that a radio code can be transmitted.

Thus far, manual actuation of the signal device has been explained. In order to effect automatic operation of the device, a coil spring 98 is positioned at 100 between the housing and a point 102 on the carriage 40. This coil spring serves to bias the carriage 40 in the position illustrated in FIG. 3. However, if a crash of the aircraft occurs, the resulting shock will cause carriage 40 to roll toward the right side of the housing as viewed in FIG. 3. A projecting member 104 fastened at one end to the fuselage housing 26 passes through carriage 40 for normal abutment with the lower end portion of hold-down arm 54. When carriage 40 moves toward the right end of the housing, this projection will rotate the hold-down arm 54 clockwise as indicated in phantom. This rotation releases engagement between the hold-down arm 54 and box 16. Inasmuch as line 86 is of a fixed length and is connected between the upper end portion of hold-down arm 60 and the housing wall, displacement of carriage 40 will cause the hold-down arm 60 to rotate in a counterclockwise direction as indicated by the phantom position 90. Thus, substantially simultaneous disengagement of the hold-down arms 54 and 60 from the box 16 occurs when the carriage is displaced. When this disengagement is effected, the aforementioned ejection of box 16 and the components mounted thereto occurs followed by inflation of balloon 18 and radio transmission. The box 16 functions as an airborne anchor or flotation member for the balloon depending upon choice of construction material.

An alternate means for ejecting or propelling the balloon from a craft is by substituting a dynamite charge, as shown in

FIG. 5, for the frusto-conical spring 46. The control for the charge includes a switch 112, such as a microswitch, that is suitably mounted adjacent one of the hold-down arms 54, 60. When the arms open, the switch is closed and a detonator circuit is completed between battery 114 and charge 110. This means for ejection is particularly suitable for large planes.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A signal device stored in a housing and comprising a visual indicator, means for propelling the indicator to a point removed from the housing, means responsive to indicator displacement for maintaining the indicator in an area removed from the housing, the propelling means comprising a spring member disposed between the indicator and a supporting base, hold-down means normally restraining the indicator against the spring member, trigger means for releasing the hold-down means thereby allowing the spring means to propel the indicator outwardly from the housing, support means supporting the base to allow movement of the base relative to the housing, the trigger means comprising a member projecting from the housing for rotating a first pivotally mounted section of the hold-down means from engagement with the indicator when the base moves, and means connected between a second pivotally mounted section of the hold-down means and the housing for rotating the second hold-down section free from engagement with the indicator thereby allowing propulsion thereof from the housing.
2. A signal device stored in a housing and comprising a visual indicator, means for propelling the indicator to a point removed from the housing, means responsive to indicator displacement for maintaining the indicator in an area removed from the housing, the propelling means comprising spring member disposed between the indicator and a supporting base, hold-down means normally restraining the indicator against the spring member, trigger means for releasing the hold-down means thereby allowing the spring means to propel the indicator outwardly from the housing, the trigger means comprising cam means connected to the hold-down means through linkage members and a trigger member for displacing the cam means thereby causing displacement of the linkage members which results in disengagement between the hold-down means and the indicator followed by propulsion thereof from the housing, support means supporting the base to allow movement of the base along a preselected path relative to the housing, second trigger means independent from the first trigger means are provided comprising a member projecting from the housing for rotating a first pivotally mounted section of the hold-down means from engagement with the indicator when the base moves, and means connected between a second pivotally mounted section of the hold-down means and the housing for rotating the second hold-down section free from engagement with the indicator thereby allowing propulsion thereof from the housing.

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