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[73] Assignee **The United States of America as**
represented by the Secretary of the Navy

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7.4, 37.6, 34.4, 6; 240/2.25

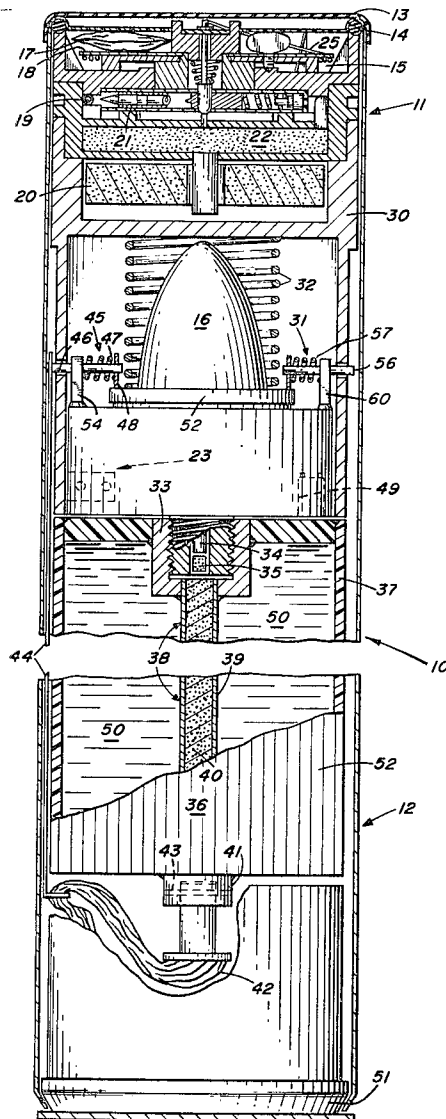
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[54] **AIR-TO-GROUND TARGET-MARKING DEVICE**
2 Claims, 2 Drawing Figs.

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102/35.6, 240/2.25
[51] Int. Cl..... **F42b 25/02**

ABSTRACT: A delivery system for air-to-ground markings which comprises a bomblet-containing marking material and provided with a sensor which operates to trigger release of said marking material within a few inches of treetop or near ground surface.



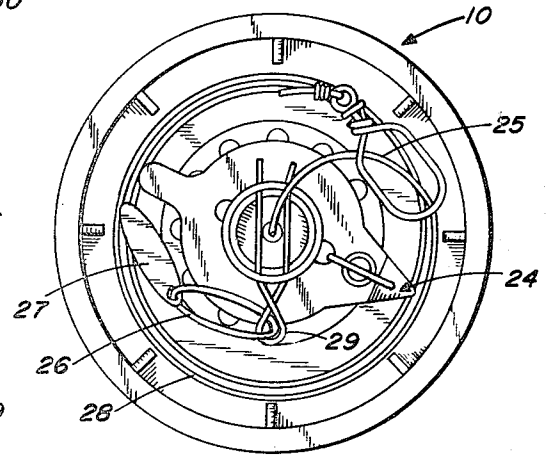
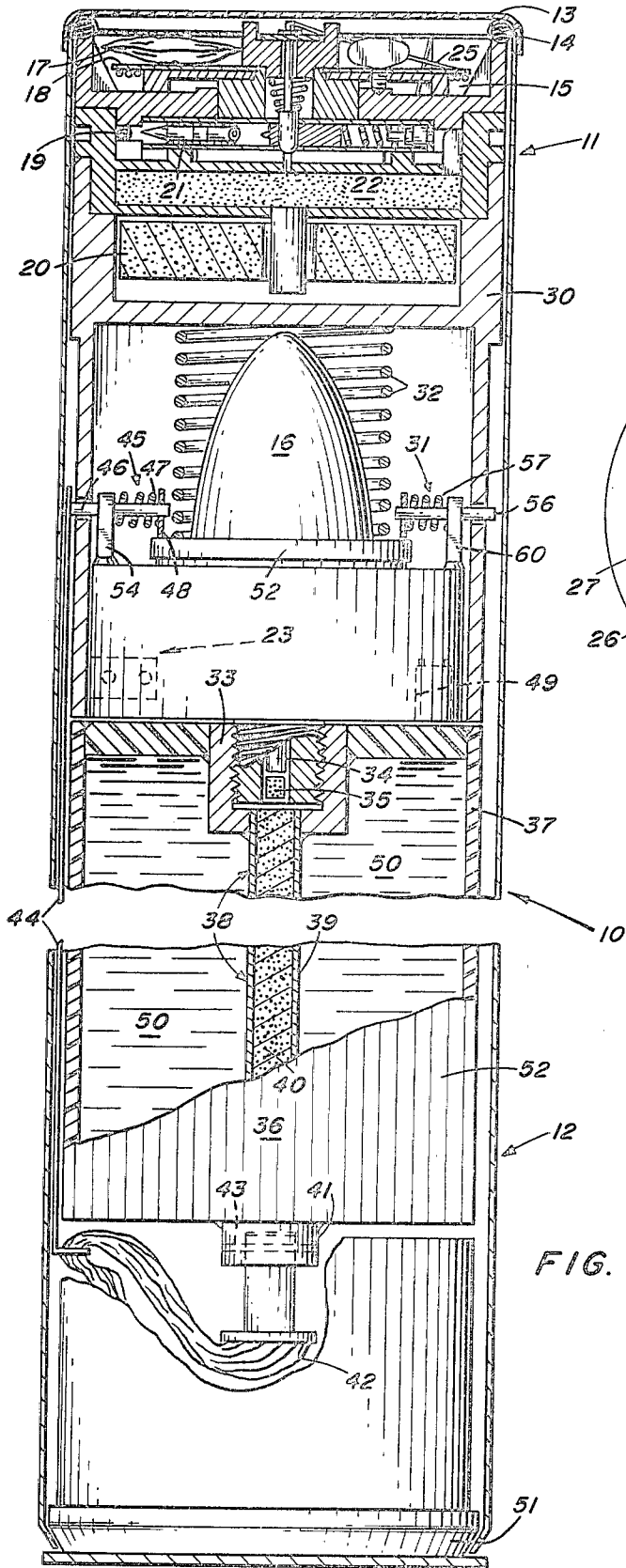


FIG. 2

FIG. 1

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AIR-TO-GROUND TARGET-MARKING DEVICE

GOVERNMENT INTEREST

The invention described herein 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.

BACKGROUND OF THE INVENTION

This invention relates to an air-to-ground marking system; and more particularly, to a delivery system for treetop or near-surface marking.

For air-to-ground marking weighted parachutes saturated with oxyluminescent materials have been used. Although the parachute-type marker is a simple and safe system which does not require an arming device and can be easily launched, they are inaccurate. The wind drift greatly affects the parachute because it must be large enough to provide sufficient signal. It also tends to collapse around tree limbs and branches thereby reducing the marked area and signal utility. The present invention provides a system for optimum treetop or near-surface markings which is accurate.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal section of the present invention; and FIG. 2 is an enlarged end view with weather cap and lanyard retainer removed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings there is shown in FIG. 1 a preferred embodiment of this invention which comprises a hollow cylinder 10 having a fuze end 11 and a parachute end 12, being closed at its fuze end by plastic weather cover 13 sealed by means of O-rings 14, and at its parachute end by a metal end cap 51. The fuze end contains an ejection fuze assembly 15 and a proximity fuze assembly 16. Any conventional ejection fuze which fits cylinder 10 can be used, such as that used in aircraft parachute flare, MK 24. The ejection fuze assembly 15 comprises generally a desiccant bag 17, a lanyard retainer 18, a time fuze 19, a ejection plunger 20, black powder pellets 21 and an ejection charge 22. The proximity fuze can also be any type which fits cylinder 10, such as the sensing fuze used in the 81 mm. mortar which as used herein was provided with a bore rider 23, which is a microswitch. Beneath weather cover 13 is the fuze-setting dial 24 and a flexible stainless steel lanyard 25 about 40 inches long. In FIG. 2 there is shown an exploded view of the fuze end of cylinder 10 with the lanyard retainer and weather cap removed. Pull ring 26 and instruction tag 27, along with lanyard 28 are shown in place. Ejection fuze 15 is set by dial means 24 which is held in place by retaining pin 29. Near the fuze end of lanyard 28 is a pull ring 26 which separates the lanyard from the cylinder when a force of about 30 pounds is exerted. Ejection fuze 15 as shown in FIG. 1 is firmly fitted into cylinder 10 and fits against sabot 30 which is held in place by means of a retaining ring mechanism 52. Proximity fuze 16 is positioned within said sabot 30 and rests on sabot separation spring 32. Proximity fuze 16 is provided with a bore rider 23 which is a microswitch set to be closed when fuze 16 is inside sabot 30. Said sabot is held by friction over said proximity fuze. Fuze 16 is also provided at its aft end with externally threaded hollow cuplike member 33 containing an electrical detonator 34 and a booster pellet 35 composed of a high explosive. A bomblet, designated generally by numeral 36 comprising a thin-walled container 37 having a burster column 38 comprising a metal tube 39 containing high explosive pellets 40 is fitted adjacent said fuze 16 and secured by threaded means to said member 33 containing said electrical detonator 34. Bomblet container 37 is provided at its base with a post 41 for attachment of parachute 42 which is folded into the remainder of cylinder 10. Parachute 42 is held to said post 41 by a pin 43 and is provided with a pull wire 44 which lies along the inside wall of

said cylinder 10 and is attached to sabot-retaining mechanism 45 which is held in place by means of stop pin 46 and spring member 47. Sabot-retaining ring 52 is retained by first sabot-retaining mechanism 45 which is provided with stop pin 46 and spring member 47 positioned in post 54 and by out-of-line second retaining mechanism 31 provided with stop pin 56 and spring member 57 positioned in post 60.

In operation when pull wire 44 is pulled, spring action of the first sabot-retaining mechanism 45 rotates sabot-retaining ring 52 in a clockwise direction since stop pin 46 slides freely in post 54 but is retained by stop 48. Similarly, spring 57 of second retaining mechanism 31 and pin 56 thereof are removed from holding sabot 30. Sabot separation spring 32 aids in removal thereof from the device. It should be noted that this system works as described because retaining mechanisms 45 and 31 are slightly out of line.

Container 37 is substantially filled with an oxyluminescent composition designated by numeral 50 comprising such materials as the peramino-ethylenes which glow upon exposure to air. Tetrakis-(disubstituted amino)ethylene formulations were used. Detonator 34 is a commercially available electrical type. Parachute 42 which acts as a drogue or low-drag chute to slow the drop is also so adapted that during descent the sensor (fuze 16) is facing the ground for maximum sensor sensitivity. This also assures that the oxyluminescent material will be distributed in a circular pattern about 30 ft. x 40 ft. in diameter parallel to the ground.

Container 37 is scored on the outside such that approximately 30 scores are equally spaced longitudinally on container 37. In this invention the container walls were 0.065 in. $\pm$ 0.005 in. thick and the grooves or scores were 0.022 in. $\pm$ 0.002 in. deep. These scores provide, on rupture of bomblet container 37, a uniform, circular distribution of oxyluminescent material 50. The oxyluminescent material is a formulation prepared so that it readily adheres to vegetation. Polyethylene powder soaked with tetrakis(dimethylamino)ethylene was used in the present invention.

In operation a pull of the lanyard 26 actuates the ejection fuze 15 whereby a preset pyrotechnic delay of 5 to 30 seconds ignites ejection charge 22. The expanding gas from the ejection charge forces all other items out of cylinder 10. Sabot 30 protects the proximity fuze 16 and acts also as a piston. The metal end cap falls free and the parachute opens. Fall rate is about 50 feet per second. Pull wire 44 on parachute 42 operates to release sabot-retaining mechanism 45 whereby the sabot 30 falls free of its own inertia. Sabot separation spring 32 helps force the sabot away from fuze 16 causing the bore rider 23 to open. The switches then close the battery power, designated generally 49 in fuze 16 and open a short circuit on electrical detonator 34. Fuze 16 senses within a few inches of treetop or near surface and the detonator is triggered so as to initiate booster pellet 35 which ignites burster charge 40 whereby rupture of bomblet container 37 disseminates the oxyluminescent material 50 therefrom.

This invention provides a treetop or near-surface marker with optimum dissemination of the oxyluminescent or other marking material. It is relatively accurate when launched from standard retrolaunchers. Tumbling before ejection actuation does not greatly vary accuracy since horizontal velocities are nearly nulled by the retrolaunch. The low-drag ribbon parachute is not significantly affected by winds.

The resulting marker appears to airborne observers as a uniform source of light from 30 ft. to 40 ft. in diameter generally regardless of the amount of vegetation. (Sometimes nearby vegetation will obscure a marker viewed at some angle).

What is claimed is:

1. An air-to-ground target marking device which comprises in combination
 - a hollow cylinder;
 - an ejection fuze assembly secured to one end of said cylinder and sealed therein by means of a weather cap;

a sabot fitted along a portion of the inner wall of said cylinder upon which the base of said ejection fuze rests; a proximity fuze positioned within said sabot adjacent said ejection fuze; said sabot being friction fitted around said proximity fuze;

said proximity fuze being provided with a bore rider on one side over which said sabot fits and an externally threaded hollow cup-shaped housing positioned in the center base of said fuze; said housing having mounted therein an electrical detonator connected to said fuze and a booster pellet positioned adjacent said detonator;

a bomblet positioned adjacent said proximity fuze and secured at its forward end to said hollow cup-shaped housing;

said bomblet comprising a container provided with externally scored walls and having a burster column extending centrally therethrough, a support post on the bottom of said container, and an oxyluminescent material substan-

tially filling said container; said burster column comprising a metal tube substantially filled with high explosive pellets and adapted to be actuated by said detonator; a parachute attached by suitable means to said support post and filling the remainder of said cylinder; and an end cap closing said cylinder;

said parachute being provided with a pull wire which is connected to said sabot whereby upon release of said parachute said pull wire operates to separate said sabot which falls free causing said bore rider to open which acts to initiate said burster pellets thereby creating sufficient gas pressure to cause rupture of said bomblet container thereby disseminating said oxyluminescent material.

2. The device in accordance with claim 1 wherein the oxyluminescent material consists essentially of polyethylene powder soaked with tetrakis(dimethylamino)ethylene.

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