United States Patent

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

[54] **LOCATION MARKER FOR PRODUCING LUMINOUS DISPLAY**
5 Claims, 7 Drawing Figs.

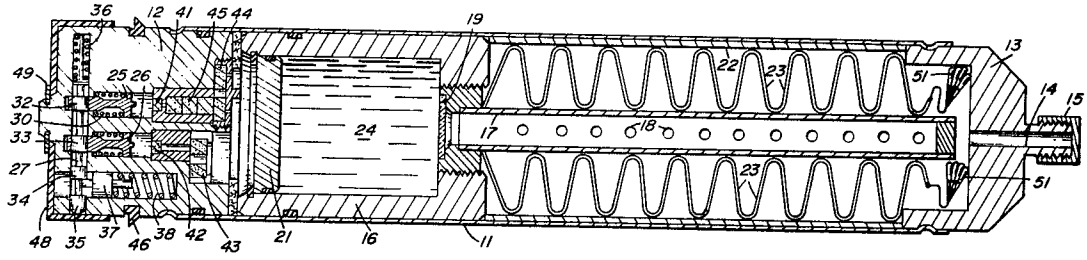
[52] U.S. Cl. ..... **240/2.25,** 102/4, 102/35.6, 102/37.6, 102/60, 102/85, 116/124 B, 252/188.3
[51] **Int. Cl.** **F21v 9/16**
[50] **Field of Search** ..... 102/37.8, 37.6, 60, 87; 240/2.25; 116/124 B

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ABSTRACT: A location marker having a first compartment containing at least one cloth streamer saturated with a chemiluminescent material and having a second compartment containing an activator composition for activating the chemiluminescent material, said first and second compartments being separated by a frangible barrier. A fuze section is provided having first and second triggering means whereby said first triggering means activates a gas-generating component to cause said activator composition to rupture said frangible barrier and saturate said at least one cloth streamer, and whereby said second triggering means actuates a pyrotechnic delay train which, in turn, ignites an explosive composition to eject said at least one cloth streamer from its compartment.



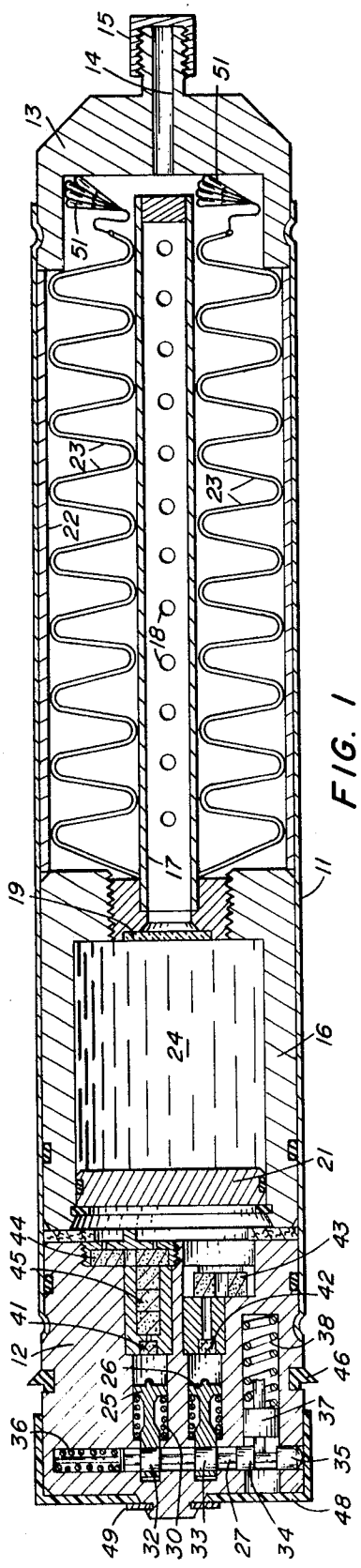


FIG. 1

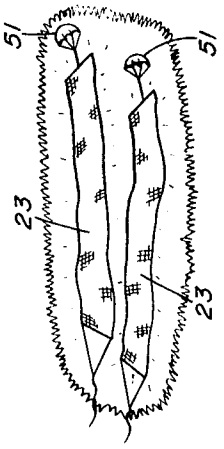


FIG. 7

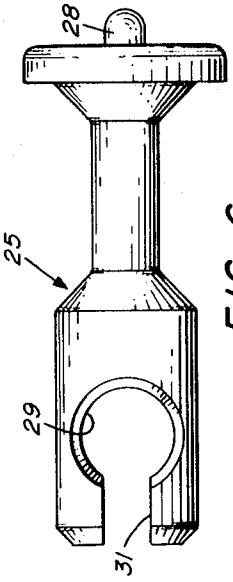


FIG. 6

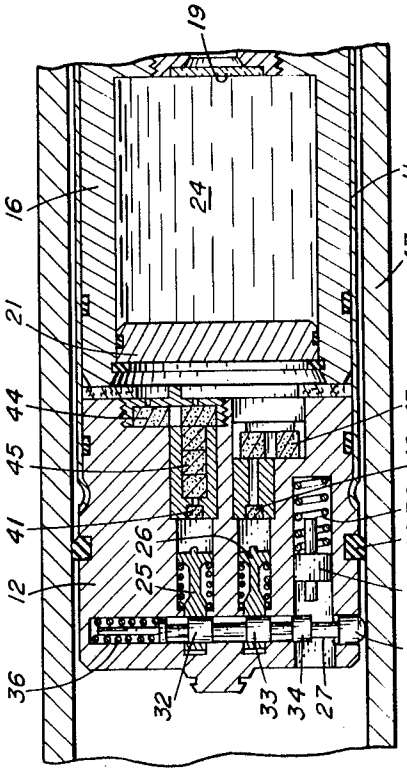


FIG. 2

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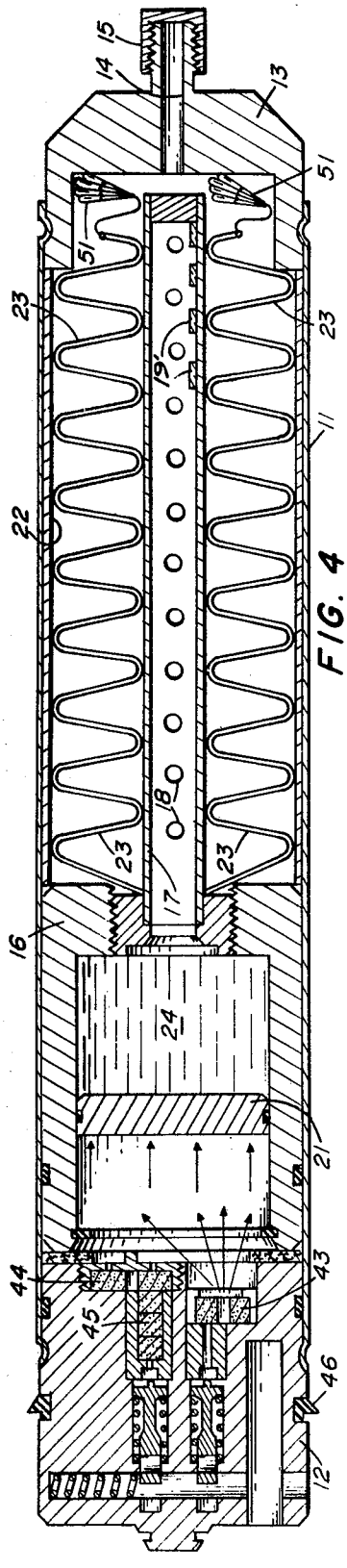


FIG. 4

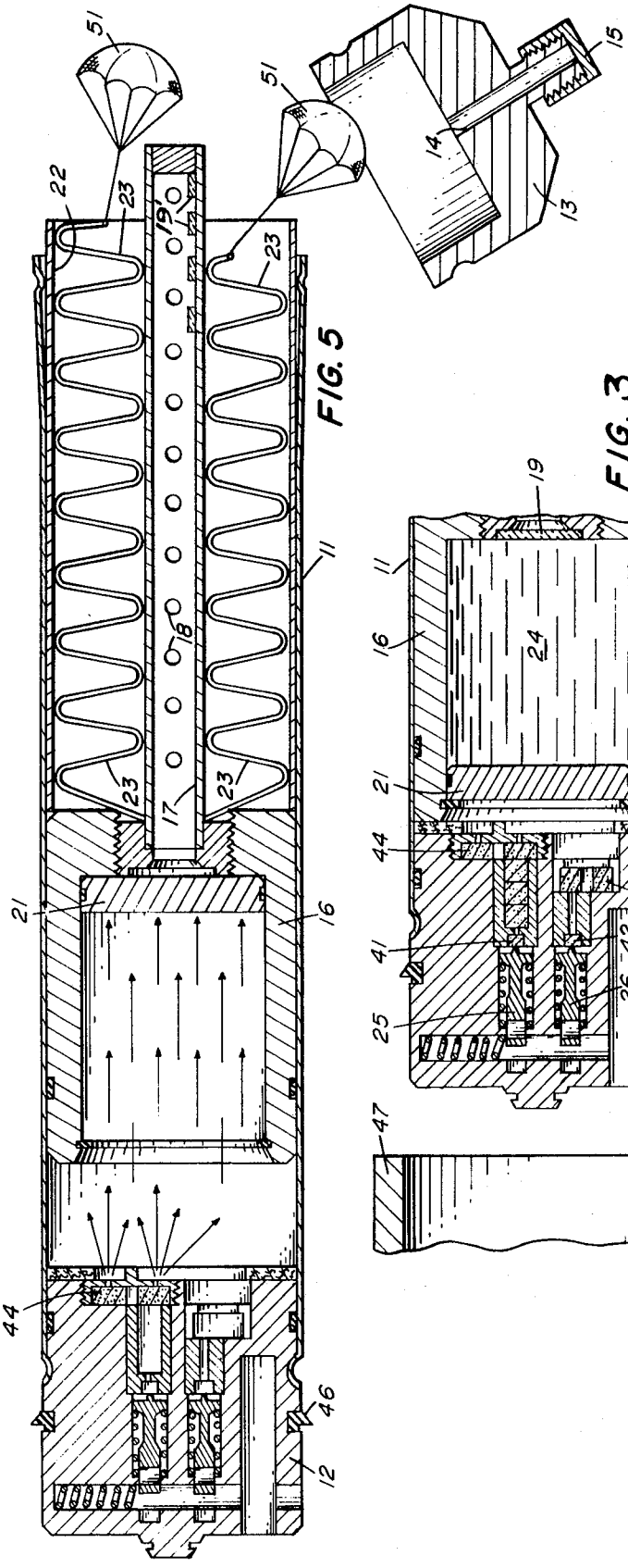


FIG. 5

FIG. 3

LOCATION MARKER FOR PRODUCING LUMINOUS DISPLAY

STATEMENT OF 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

The present invention relates to a location marker and more particularly to a location marker which can be launched from an aircraft and, when deployed on the ground, will emit a luminous display which can be seen at night by aircraft personnel.

Various devices are presently being employed to mark ground or sea locations by dropping, or launching, markers from aircraft. In general, these devices serve either to locate friendly personnel who might be in need of rescue or to locate enemy troop or supply location for future destruction. Frequently, a spot in the ocean is to be marked, such as for spotting submarines, and many of these locating device utilize the water environment to activate a smoke- or flame-producing composition. For example, one marine location marker employed during night operation by the U.S. Navy consists of a steel can containing a main charge of calcium carbide in its bottom inner section and a centrally located tube containing a smaller charge of calcium phosphide. The reaction of these chemicals with sea water produces acetylene and phosphine. Phosphine ignites spontaneously within 70 seconds after water enters the marker. The burning phosphine ignites the acetylene as it escapes from the can and a flame about 9 inches high is produced.

Another marine location marker which is used to produce both flame and smoke contains red phosphorous. Ignition is accomplished by electrical current supplied by a sea-water-activated battery. When sea water enters the battery cavity in the base assembly, the sea water acts as a electrolyte in the battery causing sufficient electrical current to be produced to initiate an electric squib which, in turn, ignites a starter mix and red phosphorus. Gases of combustion force a valve body out of the nose of the location marker thereby allowing yellow flame and white smoke to be emitted. A marker containing 784 grams of red phosphorus will burn between 13 and 19 minutes.

Still another type of location marker employed in a water environment is one containing a fluorescein dye which is expelled by an explosive charge to spread dye on the water. This marker is designed to be launched either from surface craft or aircraft to produce a daylight reference on the ocean's surface in the form of a dye slick which is used in antisubmarine warfare or as a distress signal in search and rescue operations. Unless the sea is extremely rough, these dye slick markers normally provide a marker which lasts substantially longer than the burning-type markers.

Smoke and flame producing markers are also employed by the military for locating and marking ground areas. Instead, of sea water being used as an initiating agent, however, various mechanical and chemical means are utilized to ignite a pyrotechnic composition which burns to produce a signal.

SUMMARY OF THE INVENTION

The present invention relates to a location marker having a first compartment for holding one or more cloth streamers which are saturated with a chemiluminescent material. A second compartment is provided for holding a liquid activator composition and the first and second compartments are separated by a frangible barrier, such as a glass disk. A fuze section is provided adjacent the second compartment and contains first and second firing pins. These firing pins are maintained in a cocked position by a bore rider pin which prevents actuation of the firing pins until the location marker has cleared its launching tube. A gas generator pellet is provided in the fuze section and, upon actuation of the firing pins, the gas generator pellet is ignited and gas therefrom moves a piston which injects the liquid activator composition into the first compartment containing one or more cloth streamers. An ejection pellet is also provided in the fuze section and, upon ignition of the ejection pellet, the cloth streamers are ejected from their compartment. The cloth streamers fall to the ground and provide a highly effective location marker which is visible from 5 miles for about 15 minutes.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal sectional view of a preferred embodiment of the present invention;

FIG. 2 is a partial sectional view showing a location marker in a launching tube;

FIG. 3 is a partial sectional view showing a location marker leaving a launching tube;

FIG. 4 is a sectional view showing the preferred embodiment in a fired condition;

FIG. 5 is a sectional view showing cloth streamers being ejected from a compartment;

FIG. 6 is an enlarged view of a firing pin; and

FIG. 7 is a diagrammatic view showing cloth streamers after landing in a target area.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 1 of the drawing, there is shown a cylindrical container **11** that has one end crimped to a fuze section **12** and the other end crimped to an end cap **13**. End cap **13** is provided with an opening **14** through which fluid can pass, and opening **14** is closed by a threaded plug **15** which attaches to end cap **13**. A piston housing **16** is slidably positioned inside container **11** and has a cavity for holding fluid. A distribution pipe **17**, having a plurality of holes **18** therein, is attached to one end of piston housing **16** and a frangible barrier **19**, such as a glass disk, is provided to retain fluid within the cavity of piston housing **16**. A piston **21** is slidably positioned in the cavity of piston housing **16**. An ejection cylinder **22**, which is split into two halves, is positioned inside container **11** between one end of piston housing **16** and the inner end of end cap **13**, and movement of piston housing **16** causes end cap **13** to be separated from container **11**.

One or more cloth streamers **23** are placed within container **11** and streamers **23** are saturated with a chemiluminescent fluid which can be introduced into container **11** through opening **14** in end cap **13**. By way of example, chemiluminescent fluid might be comprised of 0.2 molar bis (2, 4, 5-trichloro-6-carbobutoxyheyenyl) oxalate, 0.003 molar 9, 10-bis (phenylethynyl) anthracene, 1 percent cyanacryl terpolymer, and 2 percent bis-(2-ethylhexyl) phthalate in benzene. A suitable activator fluid **24**, which is retained in the cavity of piston housing **16**, might be 1.5 molar hydrogen peroxide in dimethyl phthalate.

Firing pins **25** and **26** are slidably positioned in fuze section **12** and are maintained in a cocked positioned by a bore rider pin **27**. The driving force for each firing pin is supplied by a separate firing pin spring **30**. As best shown in FIG. **6** of the drawings, each firing pin is provided with a tang **28**, a bore **29** and a slot **31**. Bore rider pin **27** is provided with three enlarged diameter sections **32**, **33**, and **34** and a head **35**. Enlarged diameter section **32** is slidably engageable in bore **29** of firing pin **25** and enlarged diameter section **33** is slidably engageable in bore **29** of firing pin **26** and, when so engaged, firing pins **25** and **26** are held in a cocked position. Spring **36** is provided as a driving force to move bore rider pin **27** out of fuze section **12**, however, during a cocked condition, pneumatic button **37** engages the end of enlarged diameter section **34** to prevent movement of bore rider pin **27** and release of firing pins **25** and **26**. Spring **38** is provided to maintain pneumatic button **37** in engagement with enlarged diameter section **34**.

Primers **41** and **42** are provided in fuze section **12** and are in line to be struck by firing pins **25** and **26**, respectively. A gas-

generating pellet 43, which is to be ignited by primer 42, is provided to produce gas for driving piston 21 and an ejection pellet 44 is provided to produce an explosive force for driving piston housing 16 and ejecting streamers 23. By way of example, gas-generating pellet 43 might be comprised by a mixture of magnesium and Teflon that is pressed into a pellet, and ejection pellet 44 might be black powder. Delay pellets 45 are positioned between primer 41 and ejection pellet 44 to delay ejection of streamers 23 for sufficient time to permit activator component to pass through holes 18 in distribution pipe 17.

As one method of launching the marker of the present invention is by compressed air, a sealing ring 46 of resilient material is provided around the outer periphery of fuze section 12 to prevent excessive leakage of air between the outer perimeter of the marker and the inner surface of a launching tube 47. As dropping the marker could cause movement of pneumatic button 37 and accidental release of bore rider pin 27, a safety cap 48 is provided around the end of fuze section 12 and locked thereto by retaining ring 49.

OPERATION

After the location marker of the present invention is assembled as shown in FIG. 1 of the drawings with streamers 23 therein, chemiluminescent fluid is added through orifice 14 of end cap 13 to saturate cloth streamers 23. Immediately prior to launching, retaining ring 49 and safety cap 48 are removed.

Upon launching in launching tube 47, the propelling force, such as that of an explosion, or compressed air, causes pneumatic button 37 to move inwardly thereby compressing spring 38 and freeing, or releasing, bore pin 27. Spring 36 moves bore rider pin 27 against the inner bore of launcher 47, but as shown in FIG. 2 of the drawing, the movement of pin 27 is insufficient to release firing pins 25 and 26. Upon location marker clearing launching tube 47, spring 36 moves pin 27 outwardly and releases firing pins 25 and 26 and their respective firing pin springs 30 drive firing pins 25 and 26 forwardly and detonate primers 41 and 42, respectively.

As best shown in FIG. 4 of the drawings, primer 41 ignites gas generating pellet 43 and the gas pressure therefrom drives piston 21 forwardly causing fluid 24 to break frangible barrier 19. As piston 21 continues to move forwardly, fluid 24 is forced through distribution pipe 17 and holes 18 to saturate streamers 23 and activate the chemiluminescent fluid which has been absorbed by streamers 23. Primer 41 is detonated simultaneously with primer 42, and primer 41 ignites delay elements 45 which, in turn, detonate ejection pellet 44. By way of example, delay elements 45 might be designed to ignite ejection pellet 44 about 8 seconds after gas-generating pellet 43. This delay allows fluid 24 to pass through holes 18 and saturate streamers 23 and also allows a free fall of the location marker before expellent charge 44 ejects streamers 23.

Referring now to FIG. 5 of the drawings, explosive charge 44 is shown being detonated and piston housing 16 is moving outwardly from fuze section 12. Piston housing 16 moves ejection cylinder 22 against end cap 13 and end cap 13 is separated from container 11. As piston housing 16 continues to move forwardly, ejection cylinder 22 continues to separate from container 11. When the rearward end of ejection cylinder 22 clears the end of container 11, the two halves of ejection cylinder 22 separate and fall away. To facilitate separation of streamers 23, a small drogue parachute 51 may be provided to one end of each streamer 23. Also, if desired, the other end of each streamer 23 may be fastened to either container 11 or piston housing 16 to provide a weight so that streamers 23 may be more accurately deployed. Without such a weight, streamers 23 would be highly susceptible to wind and their location could not be accurately placed by dropping from an aircraft. FIG. 7 of the drawings shows a pair of streamers 23 lying on the ground and emitting a colored glow that can be seen at night from searching aircraft.

We claim:

1. A location marker comprising,
a tubular container,
at least one strip of cloth saturated with chemiluminescent material in one end of said container,
a piston housing slidably mounted in said tubular container having a fluid compartment and a piston slidably mounted in said fluid compartment,
a quantity of activator fluid in said fluid compartment,
a frangible barrier closing one end of said fluid compartment,
means for slidably moving said piston in said piston housing whereby movement of said piston causes said frangible barrier to break and saturate said at least one strip of cloth with activator fluid, and
means for slidably moving said piston housing whereby movement of said piston housing ejects said at least one strip of cloth.

2. A location marker as set forth in claim 1, wherein said at least one strip of cloth is saturated with chemiluminescent material comprised of 0.2 molar bis (2, 4, 5-trichloro-6-carbobutoxyhyenyl) oxalate, 0.003 molar 9, 10-bis (phenylethynyl) anthracene, 1 percent cyanacryl terpolymer, and 2 percent bis-(2-ethylhexyl) phthalate in benzene and wherein said activator fluid is comprised of 1.5 molar hydrogen peroxide in dimethyl phthalate.

3. A location marker as set forth in claim 1, wherein said means for slidably moving said piston includes a first firing pin, a primer, and a gas-generating pellet whereby triggering of said firing pin detonates said primer and ignites said gas-generating pellet and gas from same pellet moves said piston to rupture said frangible barrier whereby said at least one strip of cloth saturated with chemiluminescent material is activated by said activator fluid.

4. A location marker as set forth in claim 3, wherein said means for slidably moving said piston housing comprises a second firing pin, a primer, a pyrotechnic delay train, and an explosive pellet whereby detonation of said explosive pellet after said gas-generating pellet is ignited ejects said at least one strip of cloth.

5. A location marker as set forth in claim 4, wherein said first and second firing pins are maintained in a cocked position by a bore rider pin having means for preventing triggering of said firing pins while said location marker is within a launching tube.