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3,296,967

INCENDIARY DEVICE

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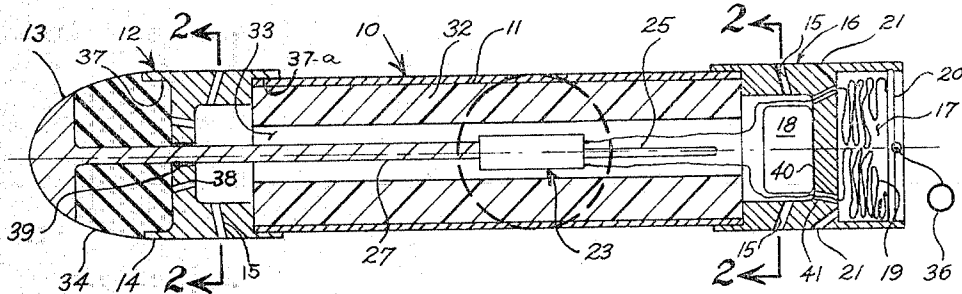


Fig. 1.

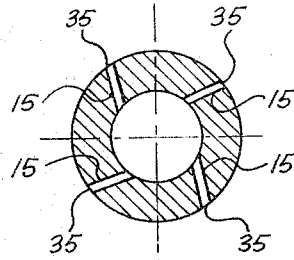


Fig. 2.

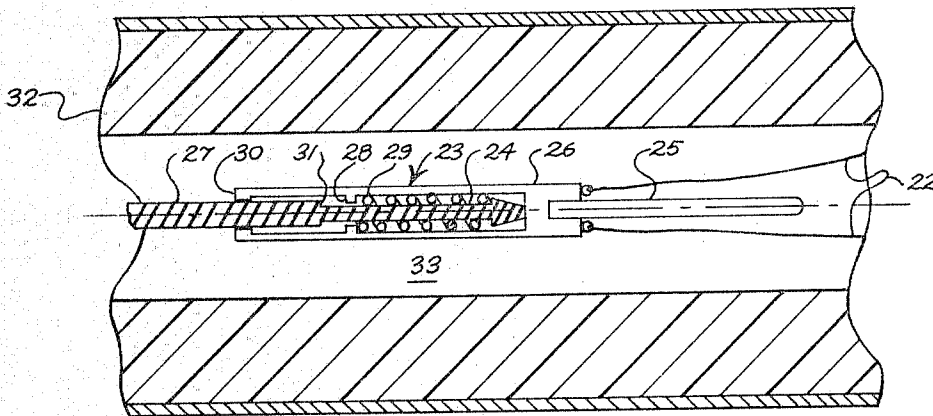


Fig. 3.

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INCENDIARY DEVICE

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13 Claims. (Cl. 102-6)

This invention relates to incendiary devices, and more particularly to incendiary devices incorporating means for self-propulsion thereby becoming capable of traversing the surface of the ground while simultaneously carrying out an incendiary mission.

Incendiary devices are well known in the art and have been used in warfare for many years. Examples of devices of this character are the torpedo used in submarine warfare and aerial missiles used against terrestrial targets. These devices carry explosive and/or incendiary material and are sometimes self-propelled as by means of a propeller driven by an internal combustion motor or a jet device to a pre-selected target area where the incendiary material is initiated by some well known means to cause destruction by fire in varying degree. Other devices are dropped as by parachute after ejection from an airplane or missile over a target area and initiated to cause incendiary destruction thereat.

However, there are disadvantages to these aforementioned devices which are overcome by the invention herein to be described. A chief disadvantage of the prior art devices is that their incendiary effect is necessarily directed toward relatively restricted areas and specific targets. In addition, such conventional devices are usually in the form of a bomb or missile dropped or otherwise launched from a flying or ground vehicle and are initiated to wreak their incendiary havoc among ground troops, buildings and munitions storage depots of the enemy. But because of their stationary nature, after initiation, a relatively great many must be used to destroy the target or otherwise carry out the objectives for which they were designed.

The present invention, however, overcomes these disadvantages while carrying out these same objectives by presenting to the art an incendiary device capable of self-propulsion over a wide range while simultaneously creating great incendiary havoc.

It is, therefore, an object of the present invention to provide a device which contains a combustible material capable, upon ignition, of ejecting high temperature incendiary gas to create a desired incendiary effect on the surrounding terrain while simultaneously propelling said device over a relatively great distance limited only by the amount of material contained.

It is another object of this invention to provide a device of the character described wherein impact means is provided to initiate combustion of said incendiary material when dropped on a surface upon which it is intended to operate.

A still further object of the invention is to provide a device of the character described wherein parachute means is provided to permit dropping the device from an aircraft whereby the area of initiation of propulsion thereof can be predetermined with some precision prior to its traversing the area and creating its incendiary havoc.

It is still another object of this invention to provide a device of the character described wherein a "safe and arm" means is provided to prevent premature initiation of combustion of the incendiary material during transportation thereof to the target area intended for its use, and is armed during the descent after ejection from an aircraft or other vehicle from which it is being launched.

These and other objects will become more apparent to

a skilled person in the art to which the invention pertains from the description in the following specification and illustrated in the drawings in which:

FIGURE 1 is a sectional, longitudinal view of the invention illustrating its several parts when assembled;

FIGURE 2 is a section view taken along either of lines 2-2 of FIG. 1 intended to illustrate forward and aft ejection passages, and

FIGURE 3 is an enlarged view of the portion of FIG. 1 within the dash circle.

Referring now to FIG. 1, there is shown an incendiary device 10 comprising a casing 11 defining a chamber 33 and a forward end cap assembly 12 attached by adhesive bonding or other means well known. Casing 11 is preferably fabricated in the form of an elongated cylinder of resin impregnated paper wherein the resin is selected from the phenolics, polyesters, polyurethanes and the like; however, other, substantially more durable, materials such as metals and the like are also contemplated for use herein. Forward end cap assembly 12 comprises an impacting nose cone 13, resilient member or cushion 34 of foam rubber or plastic and cap base 14. Cap base 14 has a forward recessed portion 37 to receive cushion 34 and a rear recessed portion 37a to receive cylinder 11. Forward recessed portion 37 comprises a pair of fluid passages 38 and a central hole 39. Base 14 further comprises internal passages 15 terminating in exhaust ports 35 (FIG. 2) which are radially off-set for a purpose to be later described. Mounted on the rearward end (to the right of FIG. 1) is an aft end cap assembly 16, similarly fashioned with off-set passages 15 and exhaust ports 35 (FIG. 2), and a partition 40 having passages 41 therein and defining a compartment 17 between it and an aft end closure or diaphragm 20. A puncturable container 18 is mounted on partition 40 preferably by adhesive bonding in the manner illustrated. Container 18 is fabricated of metal or plastic of a type selected for its compatibility with the fluid contained by container 18, usually stainless steel, aluminum, Teflon plastic and the like. Foldably confined within compartment 17 is a parachute 19 or other device for slowing the descent of device 10 when launched above ground in air. A rip cord with pull handle 36 or other manual actuating mechanism is attached to diaphragm 20 for a purpose later to be described. Communication between compartment 17 interior and the exterior of incendiary device 10 is provided by means of forwardly directed or oriented aft scoops or passages 21. Parachute 19 or other air descent deceleration device is connected by means of wires or cords 22 to a centrally position safe and arm device or assembly 23 (shown in greater detail in FIG. 3).

Safe and arm device or assembly 23 comprises a spring urged rod end 24 engaging a probe 25 by means of a connector 26. Rod end 24 is connected to, or integral with, a longitudinal rod 27 which is centrally positioned within device 10 and rigidly connected to, or integral with, nose cone 13 as shown in FIG. 1. Connector 26 is fabricated with a centrally perforated internal partition 28 for retaining a compression spring 29 as indicated in FIG. 3. At its forward end, connector 26 is formed with spring-like jaws 30 held in open position as shown in FIG. 3 by rod 27. Rod 27 has an abrupt change in diameter and thereat forms a shoulder 31 where rod end 24 connects or preferably is formed as shown in FIG. 3.

Completing the assembly of incendiary device 10 is a centrally perforated charge 32 comprising combustible, high temperature gas producing incendiary material in solid form such as any of the solid propellant materials well known in the art of rocket motors. These materials usually contain fuels in solid form which are premixed with an oxidizer in a mold where solidification through

means of the addition of a curing agent takes place to form a solid charge such as charge 32 in chamber 33. Charge 32 is molded in place in casing 11 or alternatively is a separable body insertable in chamber 33 of casing 11. In the latter embodiment, charge 32 is held in position by adhesive bonding well known to the art. Other materials such as powdered metals and the like are often added for raising the temperature of the combustion gases after ignition; hence, the incendiary effect is thereby enhanced.

In operation of the invention, device 10 is launched by any means well known, for example, from an airplane or missile overflying a specified target area such as where enemy troops may be concentrated. Device 10, as it descends, scoops air into compartment 17 through aft-scoop or air passages 21 causing it to become slightly pressurized. This pressure causes destruction of aft closure or diaphragm 20, and parachute 19, being attached to diaphragm 20 is ejected from compartment 17 and inflates, slowing the descent of device 10. Simultaneously, with the decrease in the rate of descent of device 10, connector 26 is pulled aftwardly because of attachment thereof to parachute 19 by wires or cords 22, compressing spring 29. The length and spring rate of spring 29 is selected to permit aftwardly motion of connector only to the extent that jaws 30 are permitted to engage shoulder 31 between rod 27 and rod end 24. In this manner, device 19 becomes "armed" since rod 27, connector 26, rod end 24, and probe 25 become in effect a rigid assembly. In addition, probe 25 has now assumed a position proximate to puncturable container 18 which is filled with a reactive fluid, for example, chlorine trifluoride or chlorine pentafluoride, which are capable of reacting hypergolically with incendiary charge 32. In its now armed state, device 10 continues to descend until contact is made with the target area surface.

Upon contact with the surface, impacting nose cone 13 strikes first and compresses foam rubber or other resilient material cushion 34, and causes rod 27, rigidly attached to cone 13, to move an additional distance aft until rod end 24 contacts container 33, puncturing it. Upon penetration of rod end 24 into container 33, the hypergolic fluid contained therein contacts charge 32 and ignites it. Charge 32 thus ignited, produces high temperature incendiary gas which is expelled from both ends of device 10 through passages 15 and exhaust ports 35 thereat. As is apparent from FIG. 2 (and FIG. 1), passages 15 are radially off-set with respect to the longitudinal axis of device 10 and directed rearwardly from the forward end and forwardly from the aft end to create thrust vectors which reduce to a force-couple system acting on device 10 about its central axis to cause it to roll or turn about on the surface upon which it was placed.

In addition to the force-couples created which act about the central longitudinal axis of device 10 and render it self-propelling as above stated, gases ejected from ports 35 through passages 15 also cause incendiary destruction of objects and personnel within a broad area along its path of movement.

Additionally, it is contemplated herein to fabricate the invention so that nose cone 13 and resilient cushion 34 are removable. Provision therefor is indicated by fluid passages 38 and central hole 39 in base 14. Gases emanating from burning charge 32 act against the aft surface of cushion 34 after passing through passages 38 and hole 39, causing cushion 34 and nose cone 13 to become dislodged from base 14, thereafter increasing incendiary gas flow to the surrounding terrain.

Alternatively, where air launching or descent by parachute is undesirable or otherwise impractical, provision is included in this invention for manual arming by means of rip cord 36, after which delivery to enemy territory can be effected by any well known means, for example, by a simple catapulting device, by rifle in the manner of a

rifle grenade, by mortar or other field piece, or even, when properly designed, by hand.

To operate the invention is this aspect, rip cord 36 is pulled destroying diaphragm 20 until a restriction is encountered, indicating spring 29 has achieved its "solid height" and jaws 30 of connector 26 have engaged shoulder 31 in assembly 23, thereby arming device 10. Device 10 is mounted in a launcher such as a rifle, mortar or the like or held in the hand and launched or thrown in the desired direction for impaction of nose cone 13 on the surface in the area to be subjected to incendiary damage. After impaction, operation of the invention is as hereinbefore described.

It is, of course, not required in operation of this invention that the ignition of charge 32 be accomplished by means of a hypergolic fluid such as above described. Many other means will occur to a skilled artisan for example, container 18 can be replaced with an ignitable charge of black powder or the like and a percussion type initiator mounted thereon so as to be contacted and detonated by probe 25. Detonation of the percussion initiator then ignites the ignitable charge which, in turn, ignites charge 32 as above indicated.

Therefore, while the invention has been described and illustrated with reference to a preferred embodiment, it will be apparent to those skilled in the art that other embodiments, as well as modifications to that disclosed, may be made and practiced, without departing from the spirit or scope thereof except as provided in the subtended claims.

What is claimed is:

1. A self-propelled incendiary device comprising, a hollow elongated casing defining a chamber, an incendiary gas producing charge disposed within said chamber, means for initiating combustion of said charge in said chamber, a first incendiary gas expelling means in one end of said casing communicating with said charge, and a second incendiary gas expelling means in the other end of said casing communicating with said charge, each said gas expelling means arranged in said casing ends in off-set radial relation and angularly disposed with respect to the central axis of said casing so as to propel said device on the surface of the ground in a substantially rolling motion upon expulsion of incendiary gas produced by said combustion initiated incendiary charge from said expelling means.

2. A self-propelled incendiary device comprising, a cylindrical outer casing, an incendiary charge having a central, longitudinal perforation bonded to the interior of said casing, means in said casing for initiating combustion of said incendiary charge, and a plurality of incendiary gas passage means, each in off-set radial relation and angularly disposed with respect to the central axis of said casing, in said casing proximate to the ends of said charge for passage of incendiary gas from said casing, said gas passage from said casing providing a propelling force thereto for rolling and turning said incendiary device on a surface and simultaneously exposing objects in its path over said surface to said incendiary gas.

3. A self-propelled incendiary device comprising, a central hollow casing defining a chamber, an end cap assembly attached to one end of said casing comprising an impacting nose cone, a cap base and a resilient member positioned therebetween, said cap base comprising a plurality of fluid passages each comprising an exhaust port for establishing communication between said chamber and the exterior of said incendiary device, said passages radially off-set with respect to the main axis of said device and angularly disposed thereto, a longitudinal rod attached to said nose cone and extendible through said resilient member, said base cap and into said chamber, a spring urged probe attached to said rod extendible to a position proximate to said puncturable container, means for connecting said probe to the end of said rod, an aft end cap assembly attached to the opposite end

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of said casing comprising a portion and a closure defining a compartment therebetween, a container mounted on one side of said partition comprising a chemically reactive fluid therein, a foldable parachute in said compartment, a plurality of fluid passages each comprising an exhaust port on said aft end cap for establishing communication between said chamber interior and the exterior of said incendiary device, said fluid passages radially off-set with respect to the main axis of said device and angularly disposed thereto, means for attaching said parachute to said probe connection means for positioning said probe proximate to said container, means in said aft end cap for establishing communication between said compartment and said incendiary device exterior, and a charge of incendiary material in said casing chamber for producing incendiary gas upon combustion thereof, said combustion initiated by impacting said nose cone on a surface, whereby said probe is urged against said puncturable container to release of said chemically reactive fluid therein, said reactive fluid contacting said charge for combustion thereof.

4. The invention of claim 1 wherein the incendiary charge is a solid propellant.

5. The invention of claim 1 wherein the means for initiating combustion in said charge is a fluid hypergolically reactive with said charge.

6. The invention of claim 2 wherein said incendiary charge is a solid propellant.

7. The invention of claim 2 wherein the means for

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initiating combustion in said charge is a fluid hypergolically reactive with said charge.

8. The device of claim 1 wherein means is provided for slowing descent of said device after air launching thereof.

9. The device of claim 8 wherein the means for slowing descent is a parachute.

10. The device of claim 2 wherein means is included for slowing descent of said device after air launching thereof.

11. The device of claim 2 wherein the means for slowing descent is a parachute.

12. The invention of claim 1 wherein the means for initiating combustion of said charge is a percussion initiated ignitable charge of black powder.

13. The invention of claim 2 wherein the means for initiating combustion is a percussion initiated ignitable charge of black powder.

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