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Moe

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[54] **ADAPTIVE WARHEAD**

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

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[52] **U.S. Cl.**.....**102/56,** 102/7.2, 102/DIG. 2

[51] **Int. Cl.**.....**F42b 13/50**

[58] **Field of Search**.....102/72, 56, 58, 61, 102/DIG. 2

[56] **References Cited**

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[57] **ABSTRACT**

Lethality of a missile warhead is made selective by packing a plurality of submunitions or submissiles in the warhead and adjusting the submissile impact pattern according to intelligence received by the missile during its flight to target. The mechanism comprises a collapsed diaphragm of sheet material surrounding a staged gas generator. The staged gas generator, when peripherally initiated, allows the application of a predetermined force over a relatively long time period against the submissiles with a resultant high ejection velocity in a radial direction. The same gas generator, if centrally initiated, will exhibit a short impulse duration to cause a low ratio ejection velocity.

7 Claims, 4 Drawing Figures

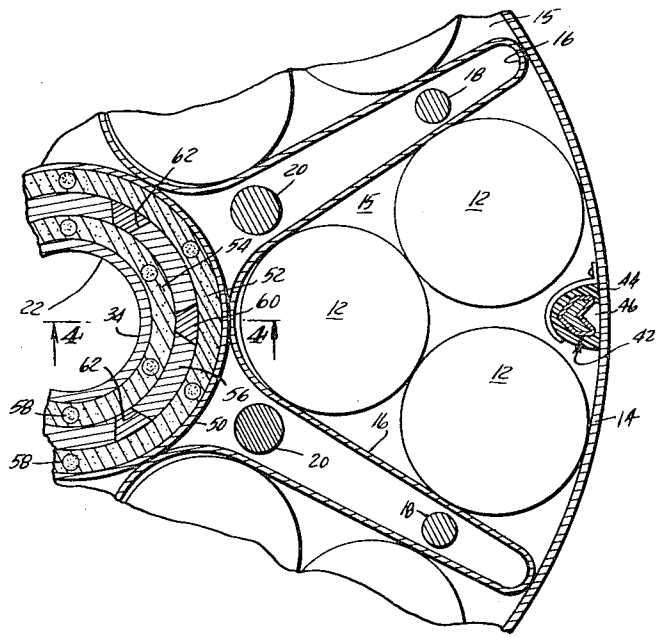

Fig. 1

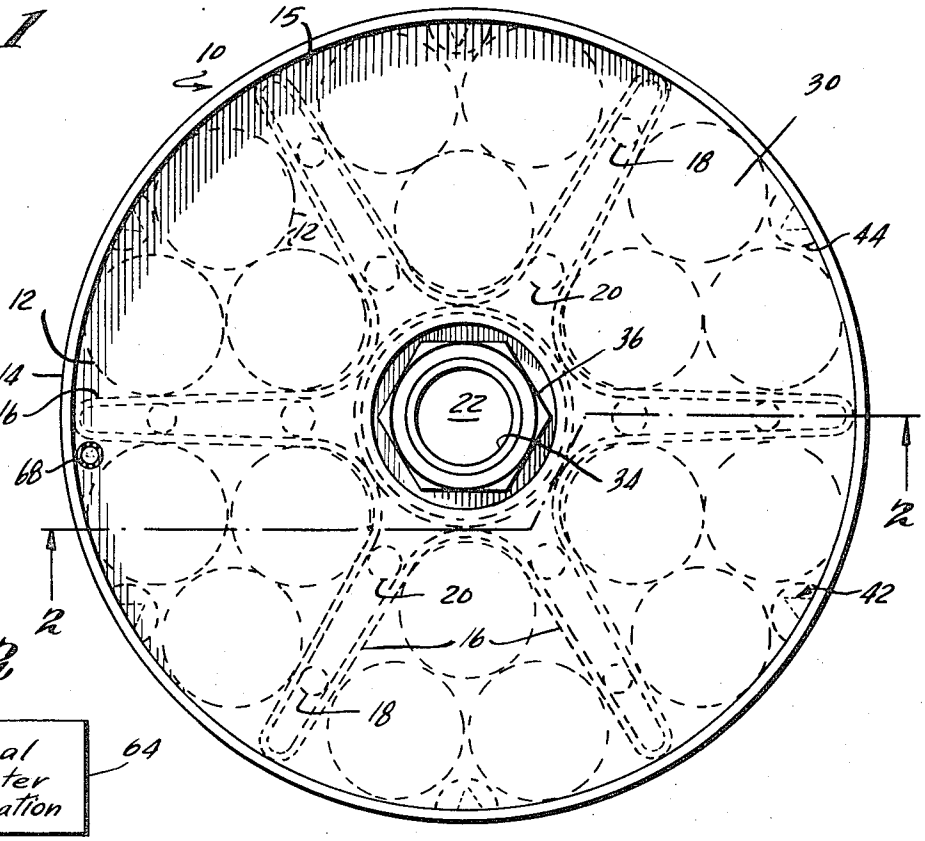

Fig. 2

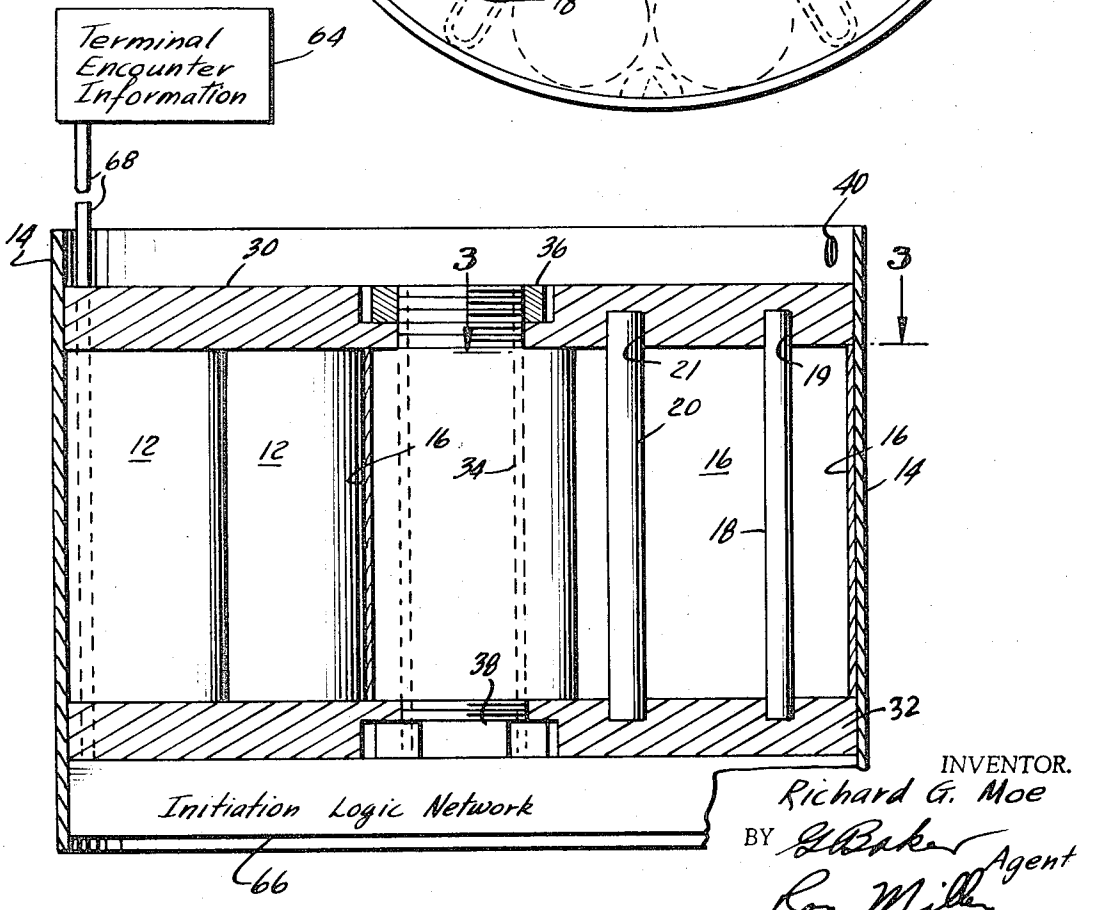

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Fig. 3

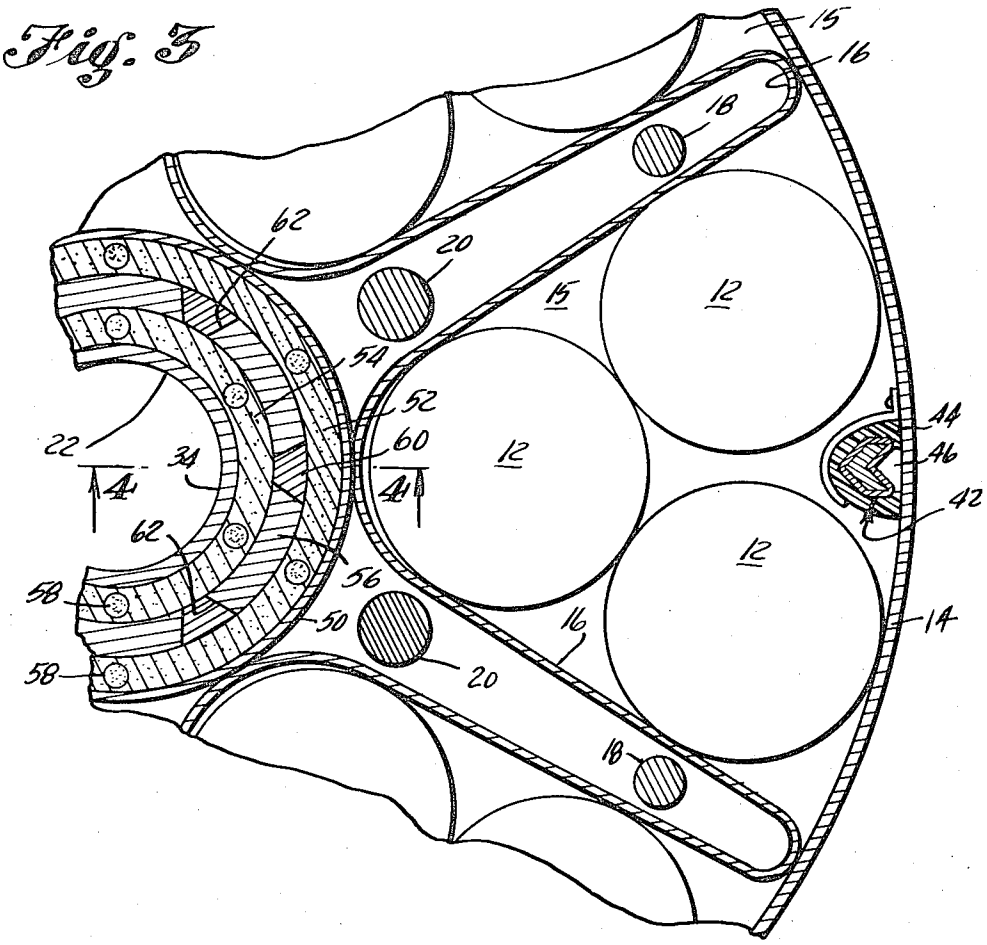
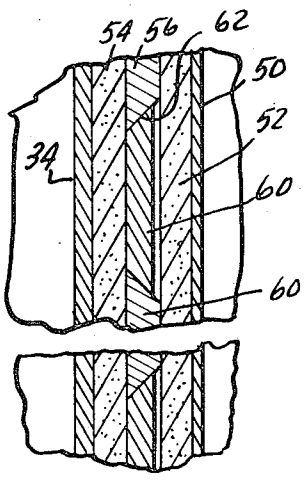


Fig. 4



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ADAPTIVE WARHEAD

BACKGROUND OF THE INVENTION

Past submunition weaponry has failed to utilize basic information available to the missile during terminal dive. For example, anti-radiation missiles (ARM), such as Shrike and Standard ARM, sense radar shut down, radar load switching, etc. The miss distances vary (generally increase) depending on what particular countermeasure tactic is being used (if any).

High radial ejection or dispersion velocities are possible by conventional methods. Most conventional devices, including standard artillery, are one stage gas generators. The major problem associated with one stage gas generators is that considerable force must be applied to compensate for the short duration (time) of force application to achieve high ejection or dispersion velocities. Long gun barrels allow pressure forces to act on the projectile for a long duration. Unfortunately, warheads do not have the dimensions required for the long gun barrel approach.

The application of large forces requires great structural strength of the munitions or projectiles (with attendant ineffective munition weight). A multistage gas generator system could be used to apply a small force over a relatively long time period with a resultant high velocity.

SUMMARY OF THE INVENTION

According to this invention, a mechanism is provided for increasing the lethal effects of submunition (or submissile) warheads by adjusting the submissile impact pattern according to missile intelligence that is available during missile terminal flight. In this situation, fuze and guidance information can be processed to cause the warhead to "adapt" to the target situation. In the event that the information (available to the missile) indicates that a direct hit or near miss is imminent, then this information is processed and little or no submunition dispersion is effected. If a large miss is anticipated, then fuze and guidance information cause peripheral initiation resulting in high radial ejection velocities.

The mechanism in the disclosed embodiment is a collapsed stainless steel diaphragm surrounding a staged gas generator. The staged gas generator, if peripherally initiated, applies a predetermined force (over a relatively long time period) against the submunitions with a resultant high ejection velocity in a radial direction. The same gas generator, if centrally initiated, will exhibit a short impulse duration to cause a low radial ejection velocity. Further, a three stage gas generator initiated at the second stage would result in a "medium" radial ejection velocity and so on.

The purpose of the multistaging is to attain higher submunition velocities than would be attainable with a single stage generator. A further advantage is that, since the ejection force is applied over a long time period, the force at any given time for a multistage generator is less than that for a single stage generator. This lessor force requires less stringent structural requirements of the munition hardware.

Of course, if the missile is on target, all submunitions are substantially simultaneously detonated by conventional detonating mechanism.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 is a top plan view of a warhead according to the invention;

FIG. 2 is a sectional view taken along line 2 — 2 of FIG. 1;

FIG. 3 is an enlarged section taken along line 3 — 3 of FIG. 2; and

FIG. 4 is an enlarged detail taken along line 4 — 4 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT:

A typical warhead according to the invention is designated generally by the numeral **10** in FIG. 1. The warhead **10** is designed to occupy a section of a guided bomb or missile and comprises a plurality of sumbmunitions **12** contained within the missile skin **14** in chambers **15** formed by the convolutions of a spacer diaphragm member **16** of sheet metal or the like.

As shown in FIG. 2 the munitions elements **12** are further confined between end plates **30, 32** spaced apart by reinforcing rods **18, 20** and connected through a hollow central column **34** which is threaded on each end to receive threaded nuts **36** and **38**, respectively, which secure the assembly. The cavity **22** in the central column is used to house typical Safe and Arm devices.

In each of chambers **15** there is a linear shaped charge device **42** (see FIG. 3) such as Jetcord or the like backed by a protective plastic conduit **44**. The shaped charge is placed longitudinally along skin **14** and is held in place by the plastic conduit **44** with an optimum stand-off space **46** between the charge **42** and skin **14** so that when the charge is initiated the skin is effectively cut along the line of the cord.

Skin **14** extends beyond end pieces **30, 32** to provide means including holes **40**, for example, to fasten the unit to other sections of a bomb or missile. The unit also includes a logic network **66** designed to select initiation mode in accordance with terminal encounter information (TEI) received through a detection and guidance system **64**. Such information (TEI) would ordinarily be received in a forward section of the missile and transmitted to an initiation logic network (ILN) **66** through a conduit **68**, for example, passing through one of the chambers **15**.

Also in FIG. 3 it may be seen that the space between the central column **34** and the inner convolutions of diaphragm **16** is occupied by two cylindrical sections **52, 54** each containing combustible material such as a propellant mix and separated from each other by a cylindrical wall **56**. Wall **56** is pierced by a plurality of slots or keyways **62** (see FIG. 4) each filled with a solid key member **60**, the purpose of which will become apparent in the discussion below. The outer portion of propellant section **52** is protected by a sheath **50** of suitable material and each of propellant sections **52** and **54** contain spaced lengths of an ignition cord **58** the ends of which may be connected to each other and also may be connected across sections **52, 54**.

OPERATION

When TEI indicates lock-on with continuing signal conducive to a direct hit, ILN selects a unitary mode

and the warhead remains intact until detonation. In this mode, one or more boosters (not shown) associated with submunitions **12** are activated to detonate all submunitions **12** with the effect of a single warhead.

Should TEI indicate a near miss from loss of signal near the target, ILN may select a *narrow dispersion mode* wherein, as detonation time approaches, shaped charges **42** are actuated in slit skin **14** after which propellant **54** is ignited and through action of wedges **60** essentially simultaneously igniting section **52**, expanding diaphragm **16**, and propelling submunitions **12** out of the warhead **10** for remote individual submunition detonation. The high pressure environment here could be used to initiate arming of the submunitions.

In a *wide dispersion mode*, ignition of propellant section **52** does not result in simultaneous ignition of section **54** because of the direction of the wedges **60** in separating wall **56**. This mode results in the available force being spread over a larger time and therefore giving greater dispersion velocity. Greater dispersal thus may be accomplished in this manner when target lock-on is lost at an earlier time. In this mode, after skin **14** is cut by charges **42**, section **52** is ignited and a first force is thereby applied to diaphragm **16**; then through cords **58** section **54** is ignited (with time delay if desired) and a second force is thereby applied.

From the above, it is evident that a warhead has been developed which has a dispersion mechanism capable of optimally adapting to changes in target situation while the missile is in terminal flight.

What is claimed is:

1. A warhead comprising:
a housing;
divider means in said housing;
said divider means forming, with said housing, a plurality of peripheral compartments and a central chamber;
submunition means in said compartments;
gas generator means in said central chamber;
initiating means for starting production of gas by said gas generator means;
said gas generator means comprising a plurality of generator elements; and
said initiating means comprising means for selectively and alternatively initiating gas production by said generator elements essentially simultaneously or in one or more predetermined sequences;
initiation of gas production simultaneously by said generator elements resulting in expulsion of said submunitions from said housing with short impulse duration causing a low radial ejection velocity; and
initiation of gas production by gas generator elements sequentially resulting in the application of the available force over a longer period of time giving a higher ejection velocity to the submunitions.

2. A warhead according to claim **1** wherein said gas generator means comprises a plurality of pyrotechnic elements.

3. A warhead according to claim **1** wherein said gas generator means comprises:
first and second pyrotechnic elements;
wall means between said element having inner and outer surfaces;
said wall means being perforate with a plurality of rectangular openings with side walls diverging from said inner to said outer surface; and
plug means comprising frustopyramidal prisms of solid material fitted into said openings.

4. A warhead according to claim **2** comprising:
wall means between adjacent ones of said elements;
said wall means having inner and outer surfaces and having a plurality of openings therein;
said openings having side walls diverging outwardly from said inner surfaces to said outer surfaces; and
wedge means closely fitted within each said opening.

5. A warhead according to claim **1** further comprising
means for sensing time of warhead approach to target; and
means operable by said sensing means to cut open said housing at a predetermined time before the warhead reaches target.

6. A warhead according to claim **1** further comprising:
means for sensing time of warhead approach to target; and
pyrotechnic means in said housing responsive to said sensing means to make a plurality of longitudinal cuts in said housing at a predetermined time before the warhead reaches target.

7. A warhead according to claim **1** wherein:
said housing is substantially cylindrical;
said divider means comprises a continuous web of sheet material convoluted to make a plurality of outwardly opening concavities and a like plurality of inwardly opening concavities;
said outwardly opening concavities being enclosed by said housing to form said peripheral compartments;
said housing including end closure means and means extending beyond said end closure means for fastening said warhead to a missile body or the like; and
means in said housing receiving time and target information and outputting distinctive signals related to the character of said information; and
means responsive to each said distinctive signal to actuate said ignition means in a particular manner indicated by said information for greater warhead effectiveness under the existing circumstances.

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