United States Patent

van Zyl et al.

[15] 3,648,610

[45] Mar. 14, 1972

[54] DUAL INITIATION SUBMISSILE

[72] Inventors: **Bernard van Zyl**, Altamonte Springs; **Robert L. Hoch**, Orlando, both of Fla.

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

[22] Filed: **June 11, 1969**

[21] Appl. No.: **832,503**

[52] **U.S. Cl.**.....**102/4,** 102/7.2, 102/67, 102/DIG. 2

[51] **Int. Cl.**.....**F42b 25/16**

[58] **Field of Search**.....102/4, 6, 7.2, 64, 65, 67, 102/DIG. 2

[56] **References Cited**

UNITED STATES PATENTS

2,972,949	2/1961	MacLeod	102/67
3,264,985	8/1966	Reed	102/4
3,332,348	7/1967	Myers et al.	102/7.2 X
3,447,463	6/1969	Lavine	102/67

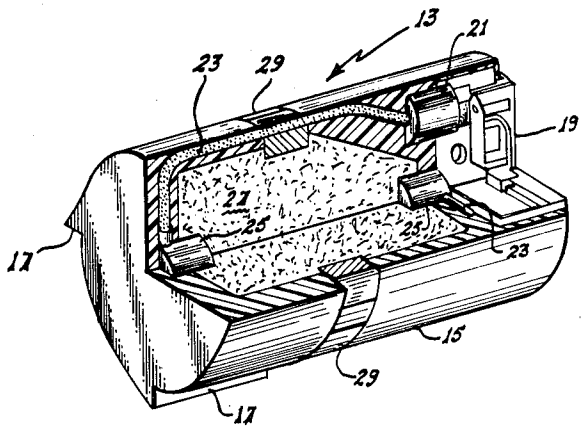
Primary Examiner—Samuel W. Engle

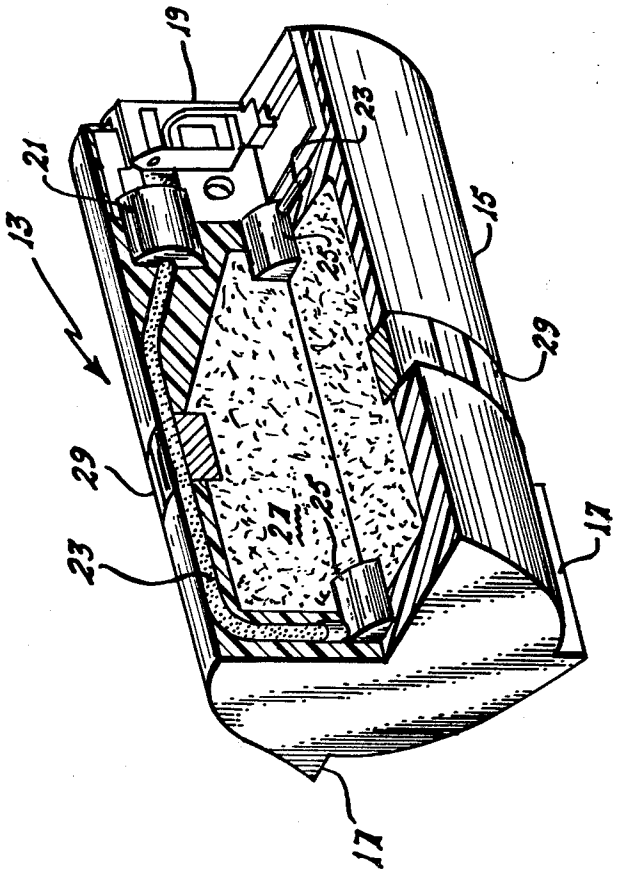
Attorney—Harry A. Herbert, Jr. and Arsen Tashjian

[57] **ABSTRACT**

A submissile having two equal lengths of an explosive wave carrier for accomplishing simultaneous dual end initiation by transferring the detonation to a booster at each end of the main charge. The end boosters then detonate the main charge producing detonation waves which collide and produce extremely high pressures at the center of the submissile where fragments are wrapped thereby projecting the fragments at unusually high velocities.

3 Claims, 1 Drawing Figure





INVENTORS.
BERNARD VAN ZYL
ROBERT L. HOCH.
BY Harry A. Herbert Jr. and
Orsen Toshjian
ATTORNEYS

DUAL INITIATION SUBMISSILE

BACKGROUND OF THE INVENTION

This invention relates to a dual initiation minibomb or submissile and, more particularly, the invention is concerned with providing a cylindrical submissile for use in a warhead wherein simultaneous dual end initiation of the explosive produces waves which collide in the center to produce unusually high pressure and project centrally wrapped fragments in a radial pattern.

In the submissile type of warhead, there is contained a cluster of small individual bombs packaged in the warhead section. This system replaces the single massive warhead for certain operational conditions. The small bombs or submissiles are forcibly dispersed from the missile or warhead. In some designs this is accomplished by either a mechanical or chemical system. In others, the submissiles are ejected due to the opening of the outer skin causing the missile to decelerate, spilling the bombs into the air. A specific pattern is then made by the falling submissiles. These submissiles are armed during flight and either detonate on target impact or after an appropriate time delay. Submissile warhead systems can be used either for surface to air, air to air, or air to ground applications.

The submissiles or bomblets are generally spherical or cylindrical in shape and contain a fuze, explosive, and fragments. Upon detonation of the explosive by the fuze, fragments are launched at lethal velocities. With a large number of submissiles being dispersed into a uniform pattern, probability of a kill against an area target can be greatly enhanced over that attainable with a single massive warhead. This can be especially true as missile guidance errors become larger.

SUMMARY OF THE INVENTION

The present invention provides a minibomb for use in a submissile system for explosively projecting fragments in a radial pattern at lethal velocities from a small volume mechanism. Higher fragment velocities are realized from the hereinafter described minibomb than from submissiles of equivalent size due to the centralized detonation wave convergence. Simultaneous dual end initiation produces an enhanced blast effect when the detonation wave converges in the central area of the minibomb. Aerodynamic control of the minibomb can be easily maintained using the simple flute arrangement without moving parts.

Accordingly, it is an object of the invention to provide a minibomb or submissile wherein fragments therefrom are explosively projected in a radial pattern at lethal velocities from a small volume mechanism.

Another object of the invention is to provide a submissile having enhanced blast pressures within a decreased volume so that a greater number of submissiles can be loaded in a warhead section while maintaining lethal performance characteristics.

Still another object of the invention is to provide a minibomb wherein the fragments are wrapped around the center periphery of a cylindrical explosive charge which is detonated simultaneously at each end by the operation of a pair of main charge boosters.

A further object of the invention is to provide a cylindrical minibomb having dual end initiation which is accomplished by simultaneously initiating one end of each of two equal lengths of an explosive wave carrier and transferring the detonation to a booster at each end of the main charge.

A still further object of the invention is to provide a cylindrical minibomb which is simultaneously detonated at each end of the main explosive charge causing detonation waves which collide and produce extremely high pressures at the center of the minibomb in the fragmentation area.

Another still further object of the invention is to provide a minibomb wherein an enhanced blast effect and fragmentation pattern is achieved through centralized detonation wave convergence. The high pressures thus obtained serve to project the fragments at a higher velocity than can be attained with typical single end or center explosive charge initiation.

These and other objects, features, and advantages of the invention will become more apparent after considering the description that follows taken in conjunction with the attached drawing of a preferred embodiment of the invention.

DESCRIPTION OF THE DRAWING

The drawing is a view in perspective of a minibomb or submissile according to the invention partially cut away to show the structural arrangement of the internal elements.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to the drawing, there is shown a minibomb or submissile generally designated by the reference numeral **13** having a plastic housing **15** which provides a case to contain the internal elements and the aerodynamic surfaces in the form of fins or flutes **17** which serve to control flight orientation of the minibomb. One end of the submissile **13** includes a fuze **19** which is armed after the submissile is dispersed into the air. A fuze booster **21** which is initiated by the fuze **19** is located in contact therewith. Attached to the fuze booster **21** are two equal lengths of an explosive wave carrier **23** such as mild detonating fuze (MDF) or sheet explosive. The other ends of the explosive wave carriers **23** are attached to two main charge boosters **25**, one each located at opposite ends of the main explosive charge **27**. The main charge boosters **25** are initiated simultaneously causing the detonation waves to proceed from the ends toward the center of the main charge **27** of the minibomb **13**. At the outer periphery of the center portion of the minibomb **13**, there are positioned a number of discrete fragments **29** which are reacted upon by the detonation waves which collide and produce a high pressure region. The fragments **29** are thus projected radially at a lethal velocity away from the submissile.

The minibomb **13**, in a typical embodiment, may be comprised of a cylindrical submissile approximately 1.25 inches in diameter, 2.2 inches long, and weighs 95 grams. It projects a single ring of 25-grain fragments **29** radially at velocities of approximately 3,700 feet per second by application of simultaneous dual end initiation of the explosive **27**. Equal lengths of mild detonating fuze **23** provide a detonating path from a single fuze **21** to the main charge boosters **25**. The plastic housing **15** provides a case and aerodynamic surfaces **17** to control flight orientation.

MODE OF OPERATION

In operation, the minibomb **13** is part of a cluster of small individual bombs packaged in the warhead section of a submissile type of warhead (not shown). These small bombs are forcibly dispersed from the warhead. After being dispersed into the air, the fuze **19** is armed. The fins **17** control submissile orientation thus providing desired impact angle. Upon impact with the target or the ground, the fuze **19** initiates the fuze booster **21** which initiates both lengths of mild detonating fuze **23**. The detonation wave is carried to the main charge boosters **25** which initiate each end of the main charge **27** simultaneously. As the detonation progresses toward the center of the main charge **27**, the waves from each end collide producing a high pressure region. The fragments **29** are then reacted upon by the gas pressure and are projected away from the submissile **13** radially.

Since the hereinbefore described minibomb **13** is smaller in size than conventionally initiated munitions with similar performance requirements, more submissiles can be packaged in the volume allotted. An enhanced blast effect operating to produce higher fragment velocities is achieved as a result of the centralized detonation wave convergence. The simultaneous dual end initiation arrangement is simple and uncomplicated and aerodynamic control of the submissile can be easily maintained using the simple flute arrangement shown without moving parts.

Although the invention has been illustrated in the accompanying drawing and described in the foregoing specification in terms of a preferred embodiment thereof, the invention is not limited to this embodiment or to the particular configuration mentioned. It will be apparent to those skilled in the art that the composition of the explosive **27** can be varied with a corresponding variation of the fragment velocity depending on the properties of the composition. Also, the geometry of the explosive charge can be changed as to length and diameter to meet specific demands. The basic configuration found to be most efficient has a length to diameter ratio of approximately 1.75. The fragments **29** should remain centralized on the main charge **27**, but additional fragments can be added along cylinder to increase the lethality of the submissile.

It should be understood that various changes, alterations, modifications and substitutions, particularly with respect to the construction details can be made in the arrangement of the several elements without departing from the true spirit and scope of the appended claims.

Having thus described our invention, what we claim and desire to secure by Letters Patent of the United States is:

1. A cylindrical minibomb for use in a submissile type warhead, said minibomb comprising a housing having end members fabricated of a plastic material capable of confining detonation waves, said housing having aerodynamic surfaces for controlling the flight orientation of said minibomb, a fuze located in one of said housing, a fuze booster in contact with said fuze, a main explosive charge substantially filling the central portion of said housing, main charge booster located at opposite ends of said main explosive charge, a plurality of discrete fragments disposed in a single row intermediate the end members and forming the outer periphery of the central portion of said minibomb, and explosive wave carriers connected between said fuze booster and said main charge boosters, said explosive wave carriers being of equal lengths to provide a detonating path for simultaneously initiating said main charge boosters thereby producing detonation waves that proceed toward the central portion of said minibomb where they collide and produce a high pressure region directly under said discrete fragments which are caused to be projected radially outward at high lethal velocity.

2. The cylindrical minibomb defined in claim **1** wherein the explosive wave carrier is fabricated of mild detonating fuze material.

3. The cylindrical minibomb defined in claim **1** wherein the length to diameter ratio is equal to 1.75.

* * * * *