

[54]	DECOY MISSILE WITH ELECTROMAGNETIC WAVE BACKSCATTER CONTROL	2,840,819	6/1958	McClellan	343/18 B
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[75]	Inventor: Kiyo Tomiyasu, Scotia, N.Y.	3,413,636	11/1968	Migdal	343/18 B

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[52] U.S. Cl. 343/18 E, 343/5 SA, 343/18 B, 343/18 C

[51] Int. Cl. G01s 9/02

[58] Field of Search 343/18 B, 18 C, 5 SA, 18 E

[56] References Cited
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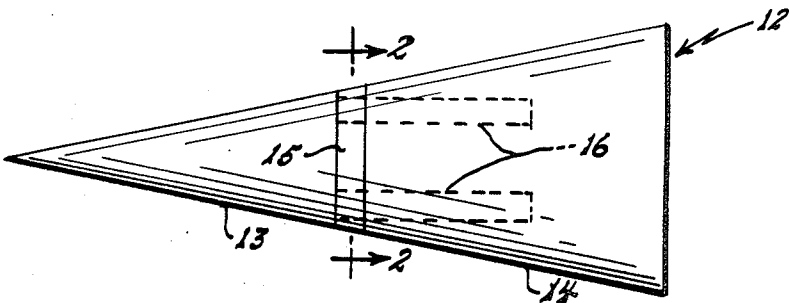
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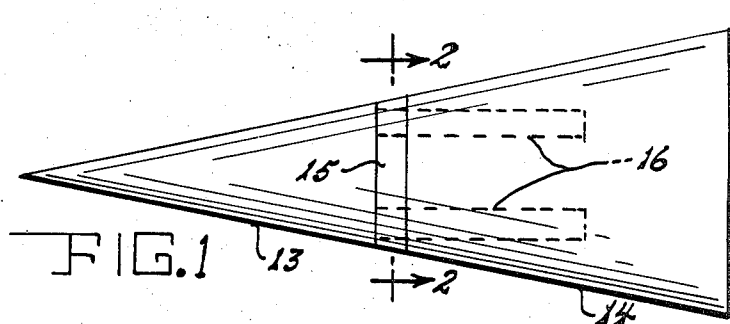
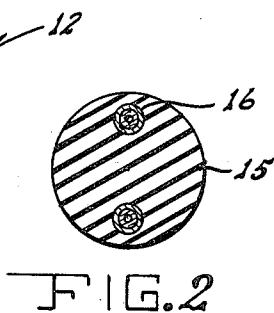
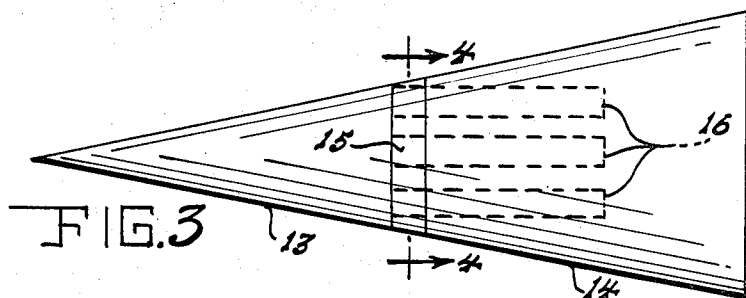
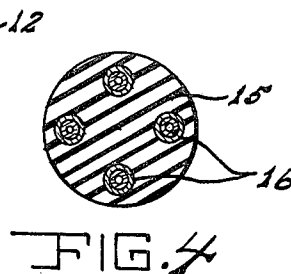
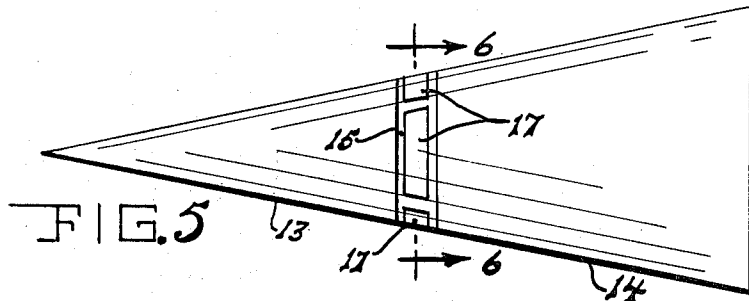
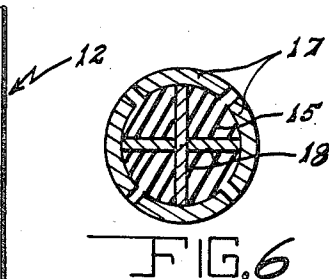
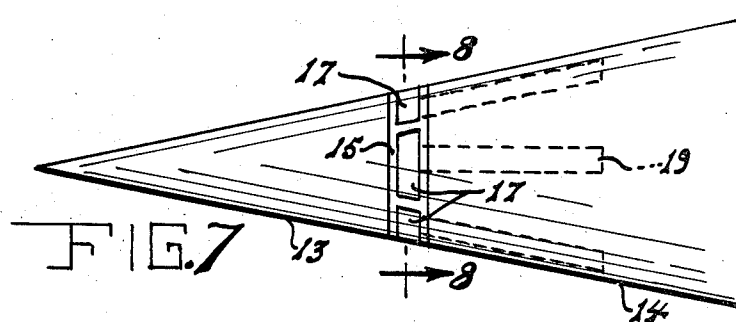
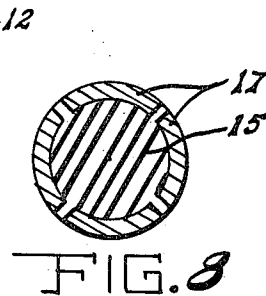
Primary Examiner—Malcolm F. Hubler

[57] ABSTRACT

A decoy missile is constructed with a centrally located dielectric region to establish electrically isolated forward and rearward vehicle sections. Various antenna arrangements are utilized to provide electromagnetic wave backscatter control. The antenna arrangements comprise combinations of laterally disposed coaxial cable stubs and peripherally disposed segmented ring antennas.

6 Claims, 11 Drawing Figures





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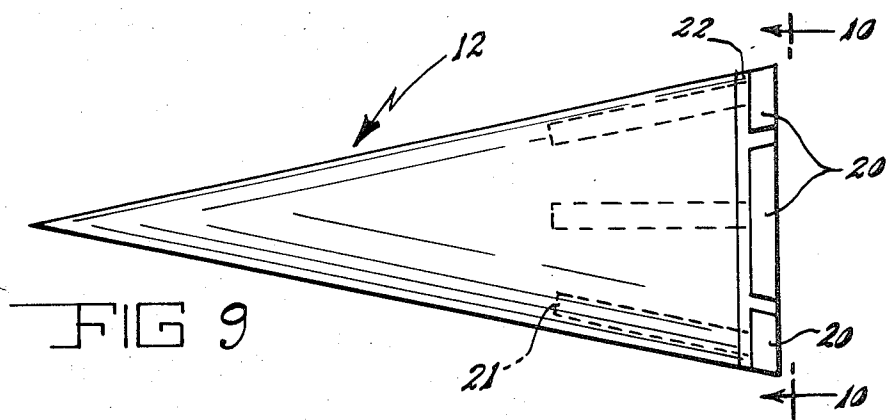


FIG. 9

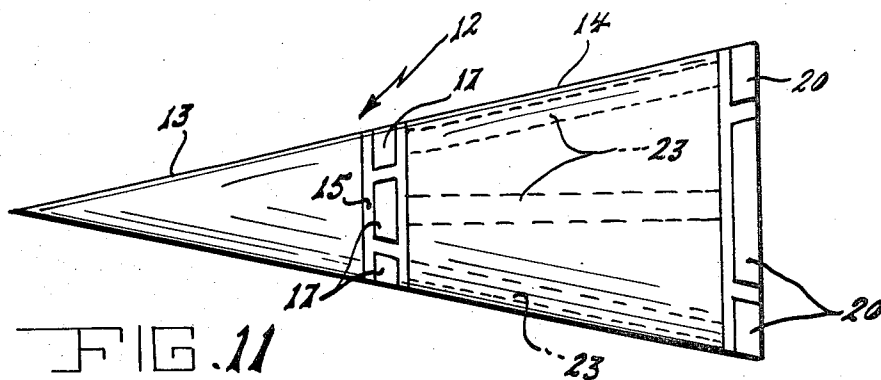


FIG. 11

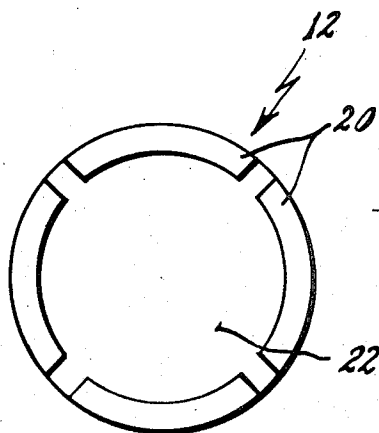


FIG. 10

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DECOY MISSILE WITH ELECTROMAGNETIC WAVE BACKSCATTER CONTROL

BACKGROUND OF THE INVENTION

The effectiveness of a missile attack system can be greatly increased by the use of decoy missiles. These are deployed in order to confuse and mislead enemy defense radar systems and to draw anti-missile missiles and defense fire away from missiles carrying actual warheads and the like. Since decoy missiles need not carry warheads they may be considerably smaller in size and lighter in weight than conventional missiles. However, in order to take advantage of the economies that can be derived by the use of such small, lightweight decoys, means must be provided to make them appear the same as actual warhead carrying missiles to a defense radar system. This can be accomplished by controlling (usually by increasing) the back scattering effect of electromagnetic waves that impinge upon the decoy missile. The present invention, therefore, is directed toward providing decoy missiles having an improved electromagnetic wave backscatter control means.

SUMMARY OF THE INVENTION

The decoy missiles comprehended by the invention are electrically severed at approximately midpoint and are provided with various antenna configurations which effect the desired electromagnetic wave scatter control. The missile is electrically severed by means of a region of dielectric material that traverses the central portion of the decoy missile vehicle.

In one embodiment either two or four coaxial cable stubs are positioned within the vehicle structure in parallel relationship to the vehicle's major longitudinal axis. The stubs are filled with dielectric material and may be folded. The lengths are chosen to yield maximum backscatter of electromagnetic waves impinging upon the decoy missile. The arrangement employing two stubs provides polarization sensitivity while the arrangement employing four stubs provides rotational symmetry. The lengths of the stubs are also designed, in accordance with conventional antenna theory, to effect desired amplitude and phase characteristics of the scattered wave.

In another embodiment of the invention a segmented ring antenna is disposed on the periphery of the region of dielectric material which traverses the vehicle structure. The segmented ring antenna comprises four arcuate antenna elements. Orthogonal pairs of the antenna elements can be connected to form an electric dipole, or alternatively each antenna element can be provided with an individual coaxial stub. Again, the line lengths are designed to provide desired amplitude and phase control of the scattered wave.

In yet another embodiment of the invention a segmented ring antenna is disposed on the rearward end of the decoy missile vehicle. The segmented antenna elements in this instance are provided with individual coaxial cable stubs which are directed forwardly into the vehicle structure. A composite antenna arrangement that includes both centrally and rearwardly disposed segmented ring antennas is also comprehended by the invention. In this arrangement individual antenna segments are joined by delay line means.

It is a principal object of the invention to provide a new and improved decoy missile that is smaller and

lighter in weight than conventional warhead carrying missiles and that includes means for controlling the backscattering of electromagnetic waves impinging upon it.

It is another object of the invention to provide a decoy missile that appears the same as a warhead carrying missile to defense radar systems.

It is another object of the invention to provide a decoy missile having coaxial cable stub antenna means adapted to increase and control backscattering of electromagnetic waves.

It is another object of the invention to provide a decoy missile having segmented ring antenna means adapted to increase and control backscatters of electromagnetic waves.

These, together with other objects, advantages and features of the invention will become more apparent from the following detailed description taken in conjunction with the illustrative embodiments in the accompanying drawings wherein like elements are given like reference numerals throughout.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a decoy missile illustrating the two coaxial stub antenna embodiments of the invention;

FIG. 2 is a sectional view of the decoy missile of FIG. 1 taken at 2—2;

FIG. 3 is a plan view of a decoy missile illustrating the four coaxial stub antenna embodiments of the invention;

FIG. 4 is a sectional view of the decoy missile of FIG. 3 taken at 4—4;

FIG. 5 is a plan view of a decoy missile illustrating the centrally located segmented ring antenna embodiment of the invention;

FIG. 6 is a sectional view of the decoy missile of FIG. 5 taken at 6—6;

FIG. 7 is a plan view of a decoy missile illustrating the combined segmented ring antenna and coaxial cable stub embodiment of the invention;

FIG. 8 is a sectional view of the decoy missile of FIG. 7 taken at 8—8;

FIG. 9 is a plan view of a decoy missile illustrating the rearwardly disposed segmented ring antenna embodiment of the invention;

FIG. 10 is an end view of the decoy missile of FIG. 9 taken at 10—10; and

FIG. 11 is a plan view of a decoy missile illustrating the double segmented ring antenna embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1 and 2, there is illustrated thereby a decoy missile 12 which utilizes the two coaxial stub antenna principle of the invention. Although decoy missile 12 is illustrated as conical in form, it may of course, be any appropriate configuration. The vehicle structure is electrically severed at approximately midpoint by means of dielectric region 15. There is thus created a vehicle structure comprising forward section 13 and rearward section 14. Coaxial cable stubs 16 are positioned within the vehicle structure to extend from dielectric region 15 into rearward section 14. The lengths of coaxial cable stubs 16 determine the amplitude and phase characteristics of the electro-magnetic

wave scattered thereby. In general, the stub lengths are chosen to yield maximum backscatter. The use of two coaxial stubs as illustrated in FIGS. 1 and 2 provides polarization dependent scattering. In the event that rotational symmetry is required, a decoy missile and antenna arrangement of the type shown in FIGS. 3 and 4 are effective. The decoy missile 12 of FIGS. 3 and 4 is again electrically severed by dielectric region 15 into forward section 13 and rearward section 14. In this instance, however, four coaxial cable stubs 16 arranged as shown are used to effect the desired scattering.

Referring now to FIGS. 5, 6, 7 and 8, there are illustrated alternative embodiments of the invention incorporating segmented ring antennas. FIGS. 5 and 6 illustrate electrically severed decoy missile 12 utilizing segmented ring antenna 17. The individual arcuate antenna elements of ring antenna 17 are metallic members disposed on the outer periphery of dielectric region 15 and orthogonal elements are electrically connected by means of interconnecting lines 18 (FIG. 6). FIGS. 7 and 8 illustrate a modified version of the embodiment of FIGS. 5 and 6 wherein an individual coaxial cable stub 19 is connected to each ring antenna segment 17. In this arrangement orthogonal antenna segments are not directly connected.

Another embodiment of the invention is illustrated by FIGS. 9 and 10. In this embodiment decoy missile 12 is not electrically severed. A segmented ring antenna 20 is affixed to the rear face of the vehicle and is insulated therefor by dielectric material 22. An individual coaxial cable stud 21 is connected to each ring segment and is directed into and isolated from the vehicle structure.

A decoy missile embodying two segmented ring antennas is illustrated in FIG. 11. This arrangement provides for the interconnection of the segment of ring antenna 17 with the segment of ring antenna 20 by means of delay lines 23.

It will be understood that various changes in the detailed materials and arrangements of parts which have been herein described and illustrated in order to explain the nature of the invention may be made by those skilled in the art with the principle and scope of the invention as expressed in the appended claims.

What is claimed is:

1. A decoy missile comprising a space vehicle structure, a region of dielectric material disposed therein to define forward and rearward electrically isolated sec-

tions thereof, and two coaxial stub members, said stub members being attached to the forward section of said space vehicle structure and extended into and electrically insulated from said rearward section.

2. A decoy missile as defined in claim 1 having four coaxial stub members, said stub members being attached in quadratic relationship to the outer periphery of the forward section of said space vehicle structure and extended into and electrically insulated from said rearward section.

3. A decoy missile comprising a space vehicle structure, a region of dielectric material disposed therein to define forward and rearward electrically isolated sections thereof, four arcuate antenna elements disposed on the outer periphery of said region of dielectric material, and means for electrically connecting orthogonal pairs of said arcuate antenna elements.

4. A decoy missile comprising a space vehicle structure, a region of dielectric material disposed therein to define forward and rearward electrically isolated sections thereof, four arcuate antenna elements disposed on the outer periphery of said region of dielectric material, and a coaxial stub member attached to each said arcuate antenna element, said stub members being extended into and electrically insulated from said rearward section.

5. A decoy missile comprising a space vehicle member, a region of dielectric material disposed on the rearward end of said space vehicle member, four arcuate antenna elements disposed on the outer periphery of said region of dielectric material, and a coaxial stub member attached to each said arcuate antenna element, said stub members being extended into and electrically insulated from said space vehicle member.

6. A decoy missile comprising a space vehicle structure, a first region of dielectric material disposed therein to define forward and rearward electrically isolated sections thereof, a second region of dielectric material disposed on the rearward end of said space vehicle structure, a first series of four arcuate antenna elements disposed on the outer periphery of said first region of dielectric material, a second series of four arcuate antenna elements disposed on the outer periphery of said second region of dielectric material, and a delay line means connecting each element of said first series of antenna elements to an element of said second series of antenna elements.

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