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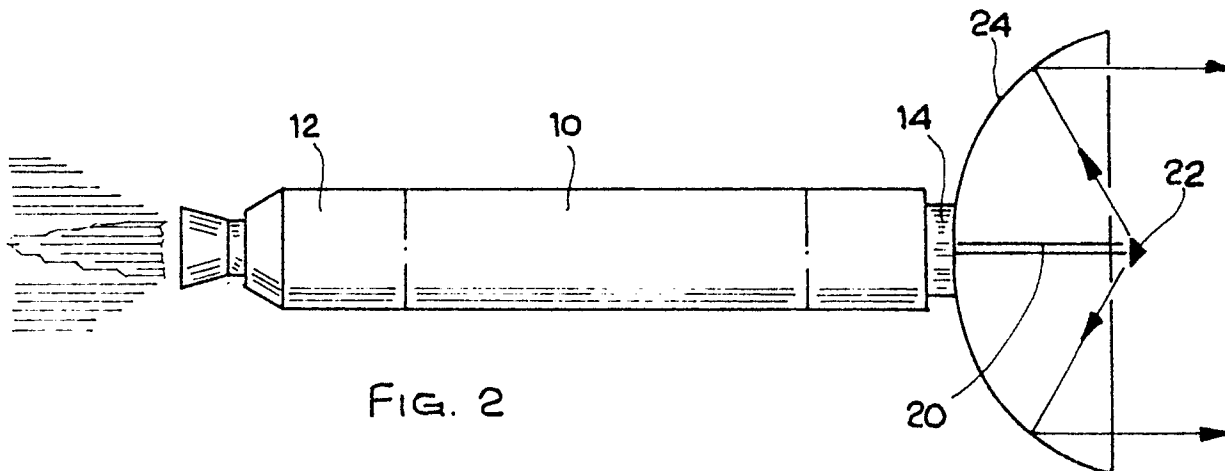
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An antenna system for exoatmospheric missiles.

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The antenna system, adapted to be mounted at the forward tip of a seek-and-track exoatmospheric missile (10), comprises a base member (14) bearing an axially oriented antenna feeder (22) and a collapsible reflector (24) which is normally enclosed in a collapsed condition within a shield (26,28) and is adapted to unfold to an operative condition after removal of the shield.

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AN ANTENNA SYSTEM FOR EXOATMOSPHERIC MISSILES

BACKGROUND OF THE INVENTION

This invention relates to an antenna system for exoatmospheric seekers, for use in exoatmospheric missiles.

It is known to use seeker missiles for seeking and tracking objects in exoatmospheric environment. To such purpose, the seeker is provided with an antenna for receiving and possibly transmitting electromagnetic waves. Since a high tracking accuracy and a high angular discrimination are required, the antenna should be as large as possible, since the accuracy increases with the antenna surface. However, the physical size, and more particularly the diameter, of the missile body has placed a limit on the effective size, or diameter, of the antenna, and therefore on its performance (beam width, side lobes, gain, etc.), because, as well known, the antenna specifications depend to a large extent on such parameter (for instance, the beam width, for a given tapering and operating frequency, is inversely proportional to the antenna diameter).

On the other hand, in an exoatmospheric environment there are no stringent aerodynamic requirements for moving objects, so that non-aerodynamic shapes, such as antennas without a radome or other protection, are permissible.

SUMMARY OF THE INVENTION

Therefore, a main object of the invention is to provide an antenna system for seekers for exoatmospheric missiles which overcomes the problem of size limitation and has an improved performance over prior antennas installed on missiles.

The invention achieves the above and other objects, such as they will appear from a consideration of the following disclosure, by means of an antenna system for seekers for exoatmospheric missiles, comprising:

- a) an antenna base member bearing an axially oriented antenna feeder;
- b) a rigid, removable shield enclosing the base member and the feeder;
- c) a collapsible antenna reflector connected to the base member, normally enclosed in a collapsed condition within the shield and around the feeder, and adapted to be extended to an operative condition after removal of the shield.

BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiment of the invention will now be described with reference to the attached drawings, in which:

Fig. 1 is a prospective view of a seeker missile incorporating a first embodiment of an antenna system according to the invention, the antenna being in a collapsed unoperative condition;

Fig. 2 is an axial cross-section of the missile of Fig. 1, with the antenna in an extended, operative condition;

Fig. 3 is a more detailed, partly diagrammatical, perspective view of the antenna system according to the first embodiment; and

Fig. 4 is a perspective, partly diagrammatical view of a second embodiment of antenna system according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

In Figs. 1 and 2, a substantially cylindrical seeker missile 10, known per se, is propelled by a rocket engine 12. At its forward tip, seeker 10 is provided with a ring-shaped base member 14, rotatably mounted on a fixed member 16 that is rigidly attached at the forward tip of the missile body. Base member 14 is provided with a set of peripherally distributed nozzles 18, inclined with respect to the radial direction, and adapted to be supplied with compressed air by means not shown, when it is desired to activate the antenna to its operative condition, as explained below.

From the center of base member 14, an antenna feeder (see Fig. 2) extends axially and forwardly to the missile, and comprises a waveguide 20 terminating in a conventional inverted horn 22 for radiating electromagnetic waves generally in the direction of the arrows in Fig. 2. The waveguide is connected to radio receiving and or transmitting means (not shown) located within the missile body.

From the periphery of base member 14 extends an umbrella-shaped reflector 24 of a flexible, electromagnetically reflective material such as metal-coated kevlar. In Fig. 1 the reflector is folded down, or packed to a furled, unoperative condition around the axial feeder 20, 22.

A rigid shield preferably comprising two sections or cheeks 26, 28 extends around and encloses the furled reflector and is adapted to be released and discarded when the missile has exited the atmosphere and is flying in exoatmospheric space.

When the shield is released, compressed air is

also fed to nozzles 18, in order to set base member 14 spinning around its axis, which coincides with the axis of the missile. The centrifugal force thus generated will then spread out the reflector to its extended, operative condition, as shown in Fig. 2 and, with dot-and-dash, on Fig. 3.

Since no aerodynamic requirements are any longer placed on the geometry of the missile now that it is flying in exoatmospheric space, the reflector can spread to a diameter several times as large as the diameter of the missile body, without any adverse effect either on the behaviour of the missile or on the integrity of the antenna system.

The release of the shield and the ejection of compressed air from the nozzles in the base member of the antenna reflector are started by a command that is part of the control system of the missile, and is beyond the scope of the invention.

Fig. 4 shows an alternative embodiment of an extendable antenna system according to the invention. The reflector is a conical metal sheet 30 that is normally coiled up in a furred, unoperative condition, as shown in full lines on the Figure. When the reflector is required to become operative, metal sheet 30 is released to spread out to its extended condition, as shown in dotted lines. The feeder in this case is a slotted waveguide 32.

Preferred embodiments of the invention have been described, but obviously equivalent changes may be made to them by a person skilled in the art, within the scope of the attached claims.

Claims

1. An antenna system for a seeker for exoatmospheric missiles, for mounting at the forward tip of the missile, characterized in that it comprises:

a) an antenna base member (14) bearing an axially oriented antenna feeder (20,22);

b) a rigid removable shield (26,28) enclosing the base member and the feeder;

c) a collapsible antenna reflector (24,30) connected to the base member, normally enclosed in a collapsed condition within the shield and around the feeder, and adapted to be extended to an operative condition after removal of the shield.

2. The antenna system of claim 1, wherein the reflector is an umbrella-shaped member of a readily flexible, electromagnetically reflective material.

3. The antenna system of claim 2, wherein said material is a metal-coated sheet of a synthetic material.

4. The antenna system of claim 3, wherein said synthetic material is kevlar.

5. The antenna system of claim 3, wherein said base member is rotatably mounted with respect to the missile, and has peripherally distributed, non-radial nozzles for ejection of compressed air.

6. The antenna system of claim 1, wherein the reflector is a spirally coiled metal sheet (30) adapted to be released to an extended, conical shape.

FIG. 1

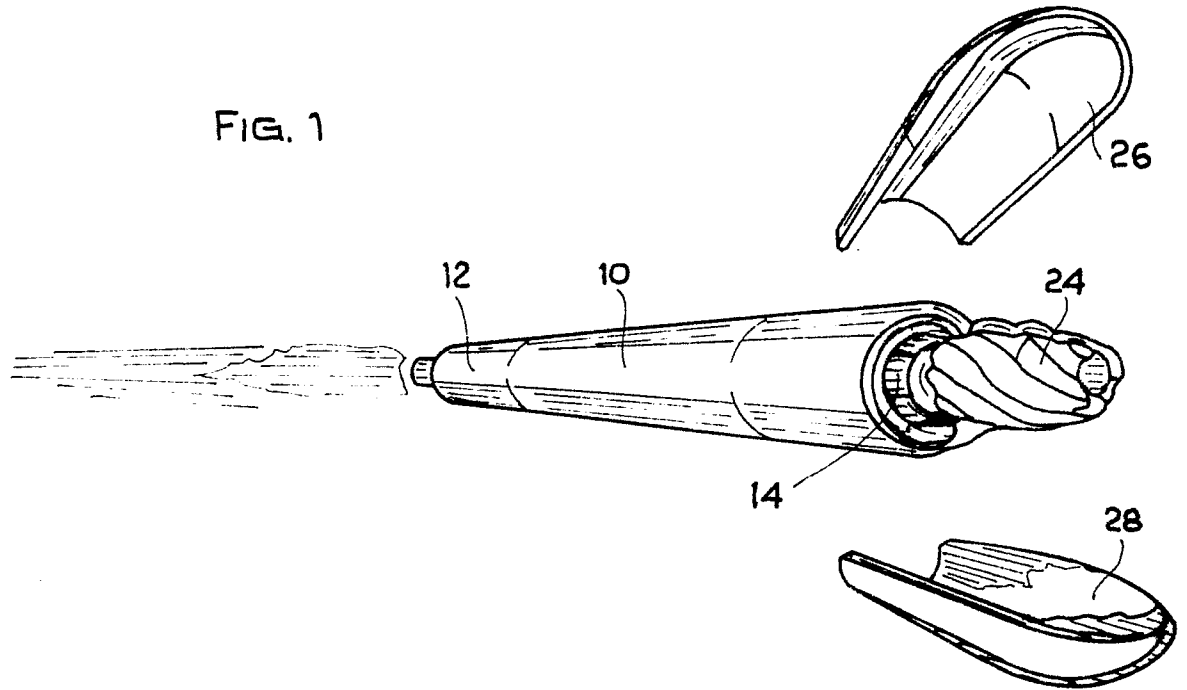


FIG. 2

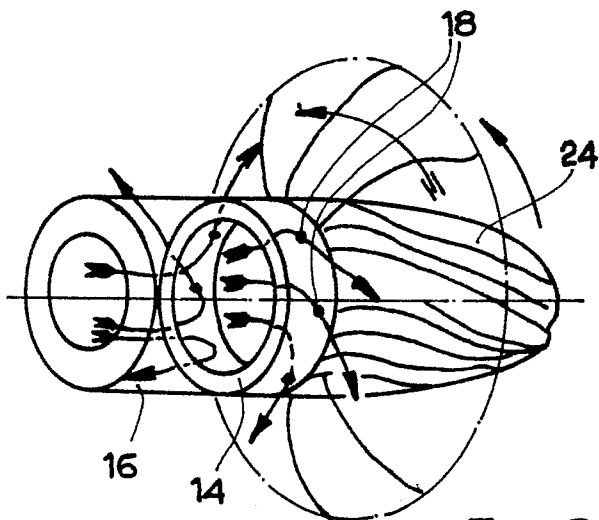
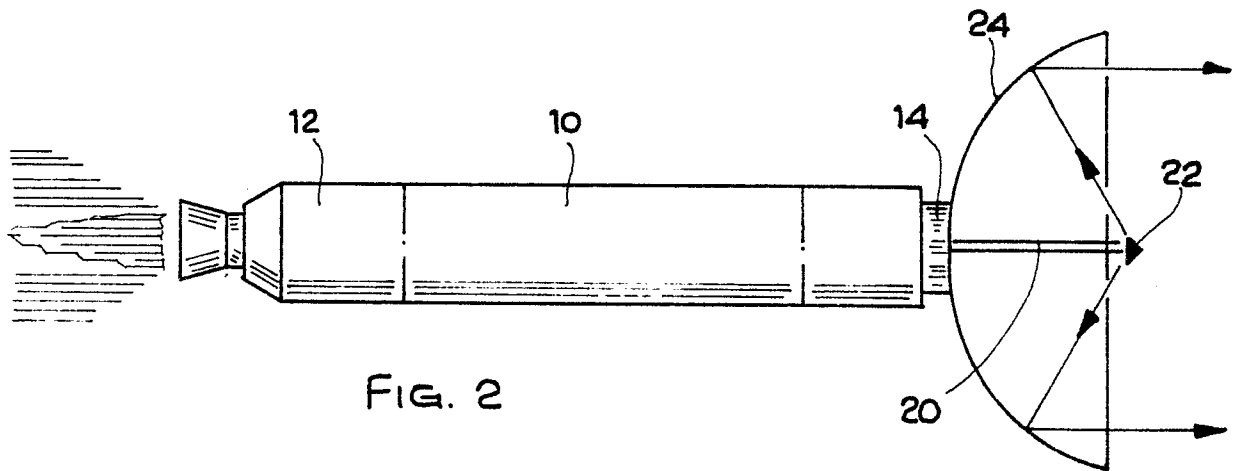


FIG. 3

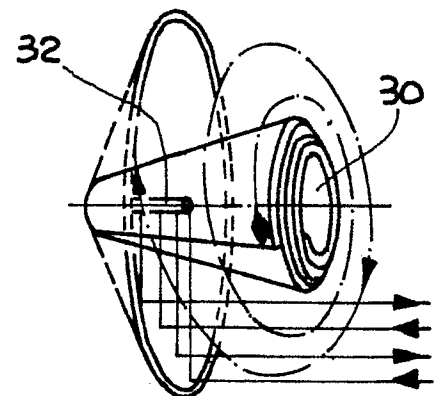


FIG. 4