WARHEAD FOR GUIDED MISSILES

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ABSTRACT

An improved air-to-surface missile having a warhead which is confined solely to the lower half of the missile, and this half contains all the fragments which would normally be distributed throughout both halves of the missile. An upper casing portion need not be employed except to maintain symmetry and aerodynamic stability of the missile as a whole.

In order to offset the slewing effect of the fragment pattern at the target on account of a low angle of approach, the fragmented lower surface of the warhead is flattened as it extends toward the rear end and is also curved upwardly so as to approach the longitudinal axis of the missile which contains the warhead.

5 Claims, 2 Drawing Figures
WARHEAD FOR GUIDED MISSILES

The invention described herein may be manufactured and used by or for the United States Government for governmental purposes without payment to me of any royalty thereon.

The present invention relates to missiles and, more particularly, to those of the guided type which contain highly sensitive guidance and other electronic equipment.

Heretofore, it has been the practice to locate the guidance system, command and proximity fuzes, initiators, also safety and arming devices, many of which are thermally sensitive, in a compartment separate from the explosive material and insulate the compartment from the casing. The heat insulation material is usually fiber glass which may also be employed to position the components rigidly within the compartment. In case there are a number of these components for controlling the operation of the missile, the compartment together with the necessary insulation take up considerable space.

Moreover, it has been found that even when heat insulation material is applied to and within the compartment, the components are subjected, at least in some degree, to the tremendous heat developed in the casing. It will be understood that these missiles are often carried in exposed positions on supersonic aircraft travelling at tremendous speed and, on occasion, are launched from pads, again at extraordinary speed, so that the casing becomes extremely hot, particularly as the missile goes through the denser atmosphere. Some of these operating components, more especially those pertaining to the guidance and igniter control, are supersensitive as regards thermal environment and may become unreliable in operation and possibly inaccurate under heated conditions.

Accordingly, an object of the invention is to provide an improved guidance missile which offers a greater degree of heat insulation of the operational components, simultaneously with affording the maximum space for the explosive material. With the improved construction, only the minimum amount of packing material, which might lessen the insulating properties, becomes necessary to position the components within the missile. This object is carried out, in brief, by positioning the components in the same compartment as the explosive material and utilizing the excellent heat insulation properties of that material to maintain the components at a temperature which is below that at which the control element which is most sensitive to heat will continue to perform at its optimum efficiency.

The explosive material in the improved missile extends into and through the space previously set apart by the control compartment so that the effective proportion of the missile and its fragment destruction power is greatly enhanced.

The invention will be better understood when reference is made to the following description and the accompanying drawings, in which:

FIG. 1 represents an elevational view, in diagram, and partly in section of the improved missile; and

FIG. 2 is an enlarged cross-sectional view taken at the line 2—2 in FIG. 1.

In the drawings, reference character 1 generally designates the casing of the improved missile. The latter is long and hollow having a large surface area but relatively small in diameter in order to cut down the skin friction. As shown in FIG. 2, the casing may comprise two thicknesses, the inner portion 2 being formed of fairly thick metal which has been partly cut through or otherwise serrated into a multidinous square pattern so as to facilitate fragmentation. Packs made of fragments of metal, also rod bundles, may be used to form this inner layer as is well known in the missile art. The outer layer may comprise a thin skin of steel to leave a smooth surface so as to cut down frictional losses as much as possible.

The front part of the casing is usually tapered to a point as indicated at 4 and is provided with the usual directing or anti-roll fins 5 of which four have been shown. This front end is also hollow and may contain the usual sensors and detecting equipment, also any contact or proximity fuze that may be necessary. The rear or tail end of the casing, indicated at 6, carries a number of stabilizing fins 7 and may also include an impulse motor (not shown) operating a jet stream. Motors of this character are well known in the art.

Missiles of the type described can be launched from pads and given tremendous initial speeds, but more often are carried on the external carriage of supersonic aircraft. The air rushing past the casing creates considerable friction, and therefore heat, even though the casing is smooth and offers only little obstruction at the fins. The friction becomes even greater when the plane is being operated at relatively low altitudes, i.e., in the denser atmosphere. In order to protect the highly sensitive devices such as, electronic equipment, fuzes, detonators, the inertial and command guidance systems, etc., from the considerable heat developed within the casing, it has been the practice to insulate these elements from the casing by containing them in one or more special compartments which are insulated by sheets or masses of fiber glass or similar material.

However, it has been found that, regardless of the type of insulation employed, there is still sufficient heat transmitted from the hot casing which may prevent the delicate instruments and apparatus from functioning at their best and might even render some of them inoperative. In accordance with my invention, I have discovered that a high explosive such as fluorinated-trinitrotoluene (TNTF) or some similar high temperature explosive, when of sufficient thickness, offers a tremendous amount of protection from heat by absorption and, yet, there is no danger of a premature explosion. The explosive material is cast in any suitable and well-known manner into a long, annular tube 8, extending from the base of the forward cone to a position in proximity of the propulsion motor 6. It will be understood that there is a thick plate of metal (not shown) separating the impulse motor from the end of the tube 8 of explosive material. The interior of the latter is predetermined so as snugly to receive the largest of the control members or components. The latter are indicated broadly as rectangles 9 of different sizes and possibly of different shapes. The smaller units of the control devices or components can be held tightly in the interior of the tube 8 by packing material 10 having high thermal insulating properties, such as fiber glass or, if desired, any other suitable type of fastening means can be employed for this purpose.
It is apparent that by extending the length of the explosive member over practically the entire length of the missile, the fragmentation portion 2 of the casing can coincide with the explosive member. The charge-to-metal (C/M) ratio therefore becomes relatively high and the devastation effect increased on account of the high energy coupling between the explosive and the metal parts.

It is further evident that due to the circular configuration of the explosive tube 8, the heat insulating properties are equally effective in all directions and therefore provide the maximum protection from the hot casing in accordance with the extremely low coefficient of thermal conduction of the explosive material.

It will be further understood that the usual igniters for the explosive material, as well as for initiating the jet motor, also the guidance controls, etc., can be fully accommodated within the annular tube of explosive material.

Typically, in terms of an exemplary embodiment of an improved missile in which adequate accommodation for the many control devices that are usually carried by a missile, the latter, for example, may have an external diameter of 12 inches, 65 inches long, with an inside diameter, i.e., of the tubular explosive material, of 8.5 inches. The 1 3/4 inch thickness of the explosive tube would obviously furnish considerable thermal insulation and there would still be plenty of room for the control devices within its interior. The long length of the missile, which not only carries a considerable charge of explosive material but also of a correspondingly greater length of the fragmentary casing, would have the high ratio of explosive charge-to-metal (C/M) of approximately unity (one). However, it will be understood that the ratio of charge-to-metal, length-to-diameter, and inside diameter-to-outside diameter of the missile can be varied widely without affecting the principles involved.

While a certain specific embodiment has been described, it is obvious that numerous changes may be made without departing from the general principle and scope of the invention.

I claim:

1. A guided missile comprising a casing having a conical head, a rear motor section and an intermediate body of circular configuration, said body being formed of a metal casing, an annular body of explosive material contained in said intermediate casing and extending the entire length thereof, and guidance and operational equipment for the missile, and means for positioning said equipment within the space of said annular body.

2. A guided missile according to claim 1 in which the explosive material has a high coefficient of thermal insulation and maintains a temperature at each and every part of said equipment below the temperature at which such part will operate at its optimum efficiency notwithstanding the heat that would normally be generated at the casing.

3. A guided missile according to claim 1 in which the intermediate body is formed of a fragmentation case.

4. A guided missile according to claim 3 in which the intermediate body is provided with a thin metal covering on the outside of the fragmentation case.

5. A guided missile comprising a casing having a directing head, a rear motor section, and a hollow intermediate body, a hollow shaped charge of explosive material in said body, said charge having a relatively low coefficient of thermal conduction and of a thickness as to maintain the interior thereof relatively cool as compared with the temperature of the casing in flight, and control devices for guiding and regulating the flight of the missile contained within the relatively cool interior of the explosive charge.