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Koepfer

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[54] **AMMUNITION COMPRISING A LAUNCHER TUBE AND A REACTION-DRIVEN MISSILE**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **89/1.816,** 89/1.819, 244/3.26

[51] **Int. Cl.** **F41f 3/04**

[58] **Field of Search** 89/1.8, 1.816, 1.817, 1.818, 89/1.819; 244/3.26

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[57] **ABSTRACT**

An ammunition construction for carriers, such as airplanes, comprises a launching tube which is adapted to be supported on the carrier and a missle which includes a front end portion which projects outwardly from the launching tube through a guide fin carrying tube section from the launching tube and a rear portion having a thrust drive engine which is supported in the launching tube. The launching tube includes a double walled formation defining a sealed annular space between the missle and the launching tube. The guide fin carrying tube includes projecting members distributed around its circumference which engage into guide grooves defined in the launching tube and the launching tube includes a holding ring having teeth which engage into recesses between the projections in order to ensure that no rotation takes place between the guide fin carrying tube and the launching tube.

3 Claims, 5 Drawing Figures

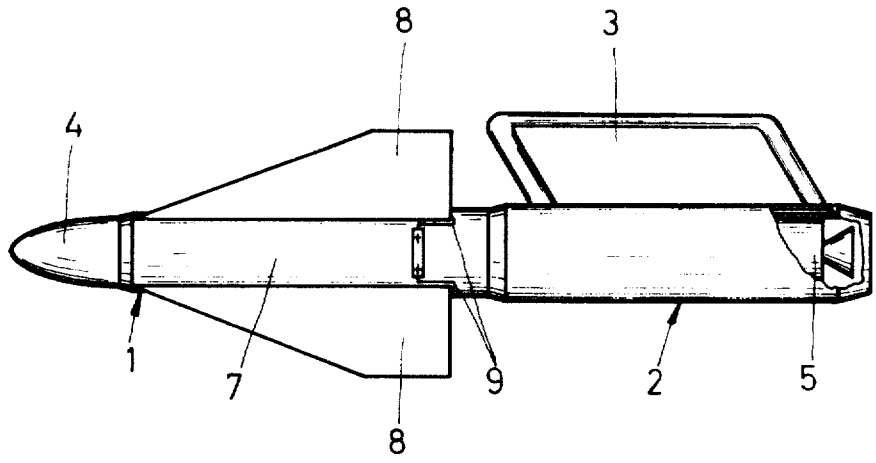

Fig. 1a

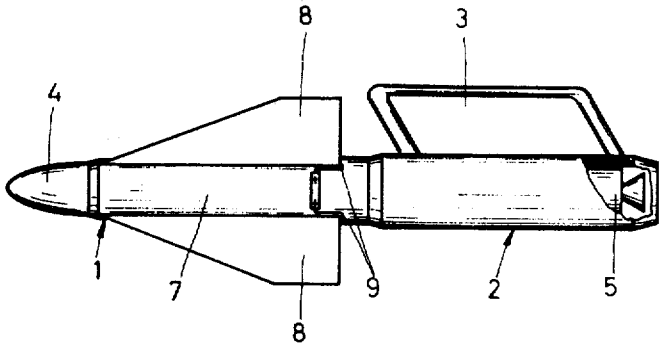

Fig. 1b

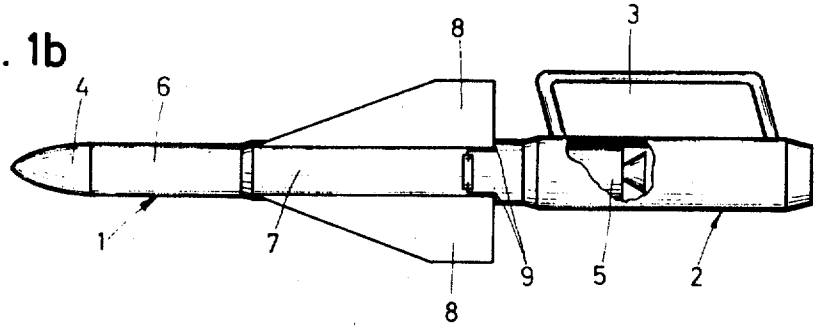

Fig. 1c

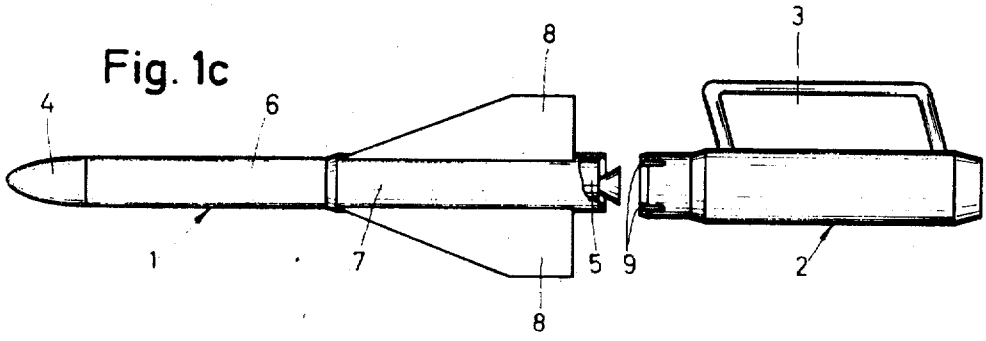

Fig. 2

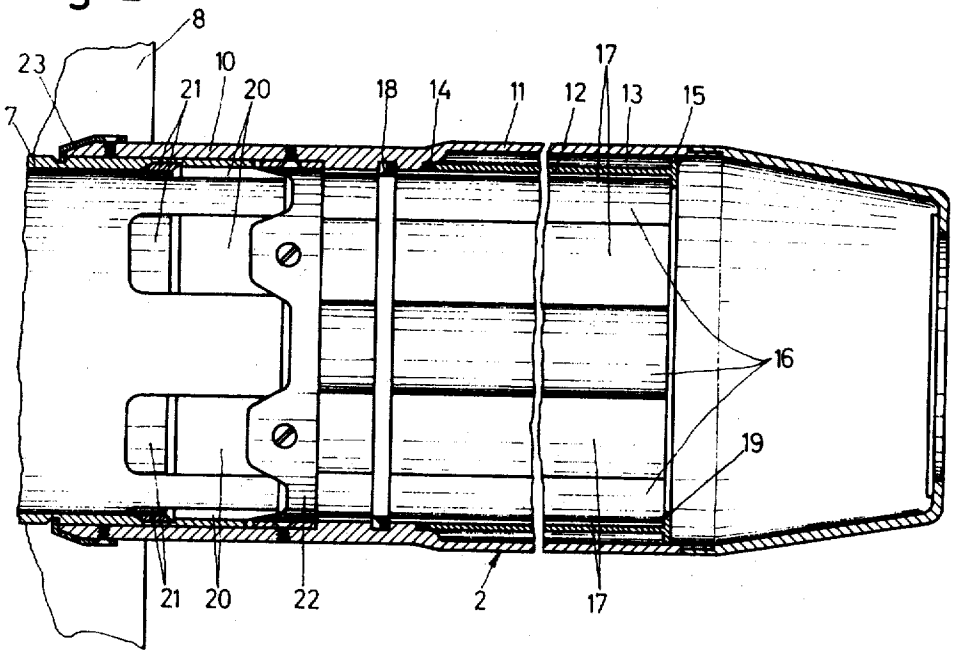
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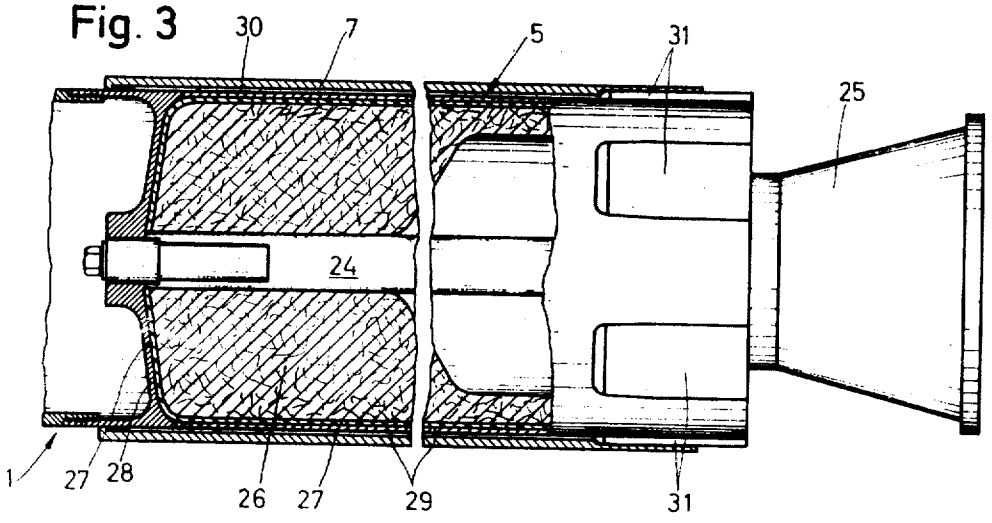
Fig. 3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AMMUNITION COMPRISING A LAUNCHER TUBE AND A REACTION-DRIVEN MISSILE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates in general to the construction of ammunition and, in particular, to a new and useful ammunition comprising a launching tube and a reaction-driven missile.

2. Description of the Prior Art

The present invention relates to ammunition of a type which is adapted to be suspended on airplanes, or similar carriers, and comprises a heat insulated missile having a reaction drive with a launcher tube surrounding at least the missile drive engine during the portion of the flight in which it is carried on the aircraft. Ammunition of this type, such as air-to-air rockets, have launching tubes which are subjected to aerodynamic heating when they are suspended on a high speed airplane and there is the danger that the missile transported in the launcher tube may be misfired by the accidental ignition of the driving rocket engine. This problem is solved today chiefly by providing heat insulating jacekts of plastic and similar materials around the missiles. Such jackets, if they are sufficiently thick, protect the missile drive against excessive thermal stresses, but they also add considerable weight to the equipment and produce a considerable increase of the drag coefficient, and thus they have the disadvantage of a substantially reduced missile range.

SUMMARY OF THE INVENTION

The invention provides a trouble-free ammunition which is simple in design and which includes means for protecting at least the temperature-sensitive drive portion against thermal overstresses as a result of aerodynamic heating, at least during the time in which the ammunition is suspended on an airplane or similar carrier, and this is done without impairing the range of the missile. This is achieved by providing at least one annular gap which is sealed from the surrounding atmosphere between the missile and the outer surface of the launcher tube. Such an annular gap provides an ideal heat protection for the missile regardless of whether they result from overdimensioning of the launcher tube and/or integrated parts. Compared to an equivalent jacket of a plastic or similar insulation comparable to the most common types of insulation used today, this means considerable savings in weight. Because of the relatively small dimensions in a radial direction, the annular air gap contributes to a much better drag coefficient and thus to a considerably increased range of operation of the missile.

Savings in space and weight also result in the stabilizer fins which are secured rigidly, not on the missile, but on a tube section which is carried along by the missile after it is launched. The arrangement includes a fin carrying guide tube section which is mounted on the launching tube to project outwardly therefrom. The missile is arranged in the launching tube with its drive engine well within the tube and it includes a forward streamlined tip which extends through the guide fin carrying tube section and projects outwardly from the front end thereof. The launching tube is advantageously slotted in an axial direction to accommodate the trailing ends of the guide fins. The constructional arrangement is such that there is a reduction of diameter and length of the launching tube. At least one annular gap, which is sealed from the outside, is located between the outer surface of the fin carrying tube section which acts as an extension of the launcher tube until it is carried along by the missile. In addition, there is an annular gap between the missile and the launcher tube to provide an additional protection of the missile against excessive aerodynamic heating during the time it is suspended on an aircraft.

Accordingly, it is an object of the invention to provide an improved ammunition which includes a launching tube with a missile which is launchable from the tube and with means defining an annular space between the missile and the launching tube.

A further object of the invention is to provide an ammunition which includes a launching tube and a guide fin carrying tube section extending outwardly from the tube and a missile disposed within the launching tube and extending through the guide fin carrying tube and projecting outwardly from the front end thereof and having means thereon for engaging the guide tube for taking it along therewith after it is fired from the launching tube and wherein the launching tube has a double-walled formation adjacent the driving engine end of the missile which is sealed in respect to the atmosphere.

A further object of the invention is to provide an ammunition which is simple in design, rugged in construction and economical to manufacture.

For an understanding of the principals of the invention, reference is made to the following description of typical embodiments thereof, as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1*a* is a side elevational view partly broken away of ammunition constructed in accordance with the invention shown in an orientation it assumes when it is mounted on a carrier;

FIG. 1*b* is a view similar to FIG. 1*a* indicating the advancement of the missile as it is being launched out of the launching tube;

FIG. 1*c* is a view similar to FIG. 1*a* showing a missile and the guide fin carrying tube section after launching from the launching tube;

FIG. 2 is a partial longitudinal section showing the interconnection of the fin carrying guide tube section with the launching tube; and

FIG. 3 is a partial longitudinal section showing the interconnection of the fin-carrying guide tube section and the missile after launching.

GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings in particular, the invention embodied therein comprises ammunition which includes a rocket-driven missile, generally designated **1**, having a trailing end with a driving engine **5** which is located within a launching tube **2** and which extends through a guide fin carrying tube section **7** and projects at its forward end or tip **4** only slightly in the carrying position indicated in FIG. **1***a*. The launcher tube **2** is suspended by means of a stirrup **3** under the wing of a high-speed airplane (not shown), for example.

In accordance with the invention, the missile **1** includes:

a. a navigation unit disposed in the forward tip **4**;
b. a rocket engine drive **5** in the form of a solid fuel type forming the rear end of the missile; and
c. an interposed warhead portion **6.**

The ammunition also includes the guide fin carrying tube section **7** which has, in the embodiment shown, four radially extending rigid stabilizer fins **8,** for example, which are distributed evenly over the circumference of the section. The fin carrying guide tube section **7** projects during suspended flight and during the major part of the launching phase from the front end of the launching tube **2.** For this purpose, the tube **2** is provided with longitudinally extending slots **9** providing recesses into which the fins **8** extend. During launching, the missile **1** moves forwardly from the interior of the tube **7** and the launching tube **2** until the front end extends outwardly by a much greater extent from the initial position shown in FIG. **1***a* to the intermediate position shown in FIG. **1***b* and finally to the end position shown in FIG. **1***c* which it assumes during flight. The tube section **7** absorbs the aerodynamic forces which act on the missile.

The connection of the launching tube **2** with the guide fin-carrying tube section **7** is shown in FIG. **2** on an enlarged scale. The launching tube **2** is made with a double-walled construction with outer and inner walls **11** and **12,** respectively, which enclose an annular gap or air space **13** which forms a heat insulation and which is sealed from the outside atmosphere by an O-ring **14** at the front end and by a projection **15** at the opposite inner end. The opposite end or mouth **10** is opened and receives the trailing end of the guide fin carrying tube section **7.** The interior wall of the launching tube advantageously includes six longitudinal stips or projections **16** made of a plastic or similar material which are arranged at equal circumferential intervals around the inner periphery of the wall. The plastic strips **16** define longitudinally extending grooves **17** there-between which extend from the rear end of the launching tube **2** up to the mouth region **10.** The longitudinal grooves, just as the annular space **13,** are secured against the entrance of air by packing washers **18** located in the mouth region **10** and which seal against the missile outer wall when the missile **1** is placed in the launching tube. The longitudinal grooves **17** and the annular gap **13** are secured against the entrance of air by packing washers **18** at the mouth end **10** and by the projections **19** of the inner tube wall **12** at the inner or rear end of the launching tube.

The fin-carrying tube section has at its inner or trailing end recesses **20** corresponding to the longitudinal grooves **17.** The bases of these recesses carry inserts **21** of soft metal or similar material. A gear ring **22** is secured to the inner wall of the launching tube **2** and prevents rotation of the guide fin carrying tube section **7** due to engagement of the inserts **21** in the receiving grooves so that the recesses **20** and the longitudinal grooves **17** are always aligned with each other. Axial displacement between the launching tube **2** and the guide fin carrying tube section **7** are prevented by locking plates **23** which are located at the mouth end **10** of the launcher tube **2.** These locking plates **23** only act until the guide fin carrying tube section **7** is brought along by the missile **1** under the force of the missile drive **5** after the missile **1** is launched.

As shown in FIG. **3,** an annular gap **30** is also defined between the guide fin carrying tube section **7** and the missile **1** and this gap is also sealed from the outside by suitable packing arranged at each end thereof. The missile drive **5** comprises a rocket engine which is also shown in FIG. **3** and which includes a combustion chamber **24** which communicates with and discharges through a thrust nozzle **25.** The combustion chamber carries a solid fuel in the form of an inner burner **26** which is supported on an outer lining or layer of a melting insulation **27.** The inner burner **26** is arranged in a housing composed of a cover **28** and a pressure jacket **29.** The pressure jacket **29** has six guide pins **31** distributed evenly over the circumference of the jacket and these guide pins engage into the longitudinal grooves **17** which are defined between the plastic strips **16** when the missile **1** is loaded into the launcher tube **2.** During launching of the missile, the guide pins **31** pass from the longitudinal grooves **17** into the aligned recesses **20** of the fin-carrying tube section **7** where they strike against the deformed soft metal inserts **21.** As a result, the fin-carrying tube section **7** is carried along by the missile **1** under the action of the drive motor **5** which is still locked by the locking plates **23** during the initial portion of lauching movement. This ensures that the guide fin carrying tube section will move along with the missile **1** to provide the necessary stabilization during flight.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. Ammunition for carriers, such as air planes, comprising a launching tube adapted to be supported on the carrier and having a launching end with an opening through which a missile is launched, a guide fin carrying tube section engaged with said launching tube and extending outwardly from said launching end, a missile having a rear thrust engine drive portion located within said launching tube and extending through said guide fin carrying tube section and terminating in a tip projecting outwardly from said section, means defining a closed space between said missile and said launching tube surrounding said drive engine for insulating said drive engine during carrying flight, means on said missile for lockably engaging said guide fin-carrying tube section as said missile is launched from said launching tube for combined flight of said guide fin-carrying tube section with said missile, said launching tube and said guide fin-carrying tube are telescopically engageable, a releasable plate mounted on said launching tube for temporarily locking said guide fin carrying tube section to said launching tube against axial movement in respect thereto, and projecting engagement means defined between said launching tube and said guide fin carrying tube section for preventing relative rotation therebetween.

2. Ammunition for carriers, such as airplanes, according to claim **1,** wherein said means for engaging said guide fin carrying tube section with said missile includes a projecting portion on said missile engageable in a recess portion on said guide fin carrying tube section.

3. Ammunition for carriers, such as airplanes, according to claim **1,** including an annular sealing member disposed in said launching tube dimensioned to engage the wall of said missile and form a seal therewith

adjacent the launching opening end thereof, and an opposite end having an inwardly extending projection of said launching tube forming a seal with said missile and closing the inner end of said launching tube, said missile being spaced inwardly from the interior wall of said launching tube at least at portions thereof which are sealed by said annular sealing member, and including an inwardly projecting portion of said launching tube engageable with the surface of said missile and sealing the inner end of said parts.

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