United States Patent [19]

Conard

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[54] **NODE SUSPENDED FLEXIBLE ROCKET**

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[52] **U.S. Cl.** **89/1.808,** 89/1.816

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

[58] **Field of Search** 89/1.808, 1.8, 1.816

[56] **References Cited**

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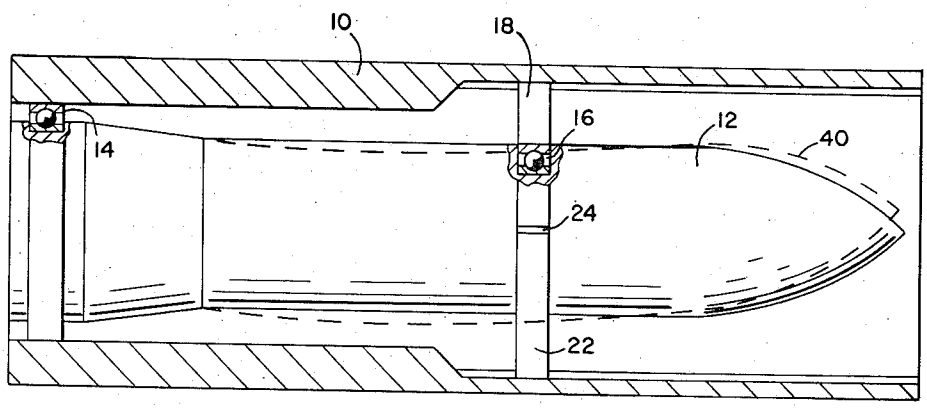
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[57] **ABSTRACT**

This invention relates to modifying a fairly conventional spin stabilized rocket by locating the bearings which support the spinning rocket at the nodes of the primary bending mode of the round. This structure allows higher spin rates than with current designs by reducing the sensitivity of the round to spin-induced bending.

1 Claim, 3 Drawing Figures



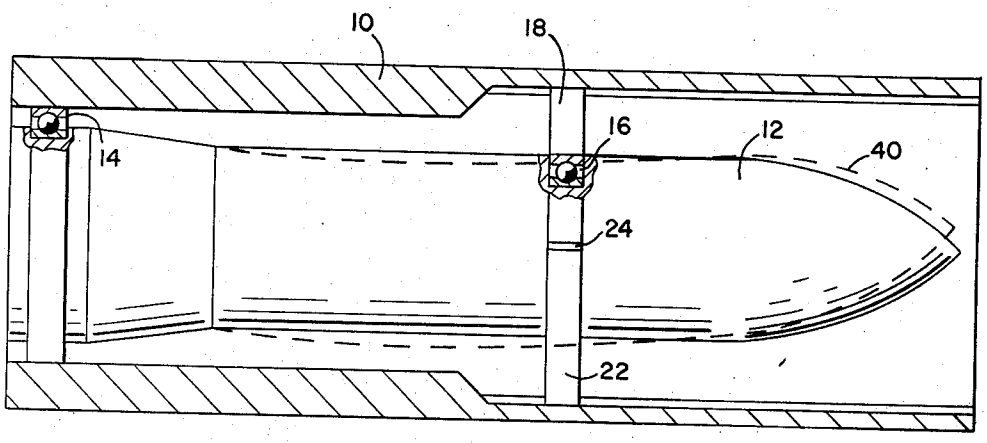


FIG. 1

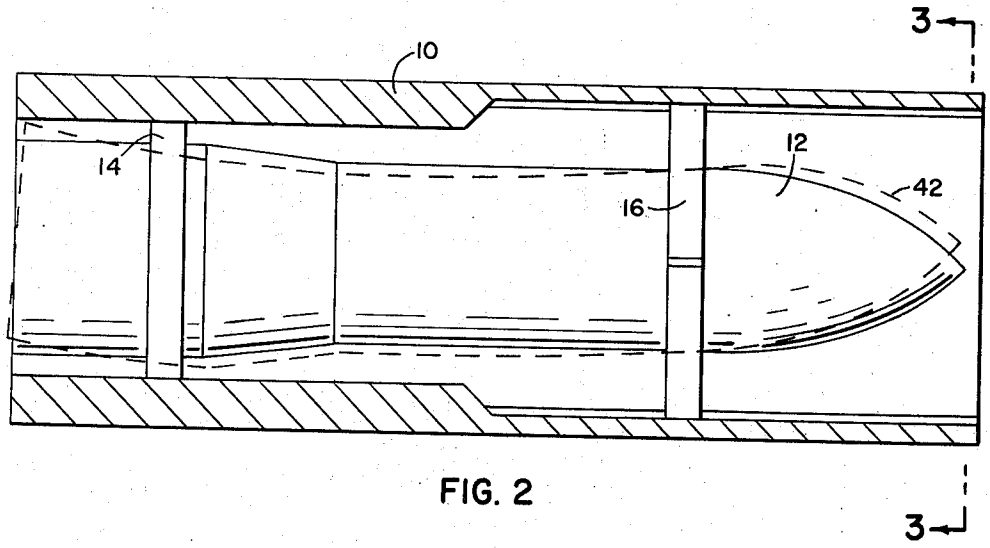


FIG. 2

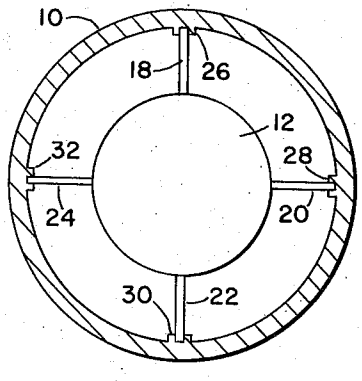


FIG. 3

NODE SUSPENDED FLEXIBLE ROCKET

BACKGROUND OF THE INVENTION

In the previous use of high spin rates above, say, 7,000 or 8,000 rpm, the residual dynamic unbalance within the missile will cause the missile to bend within the launch tube. This bending causes the principal longitudinal axis of inertia to depart from the longitudinal axis of the launcher and causes the missile to kick sideways when it changes from the clamp-clamp mode within the launch tube to the free-free mode after the missile leaves the launcher.

It is therefore an object of this invention to provide means to prevent displacement of the longitudinal axis of inertia from the longitudinal axis of the launcher while the missile is in the launcher.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a conventional spin stabilized rocket constructed in accordance with the prior art.

FIG. **2** illustrates the rocket of the present invention.

FIG. **3** is a section taken on line **3—3** of FIG. **2.**

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings wherein FIG. **1** illustrates the prior construction and FIG. **2** illustrates the construction according to the present invention, **10** indicates the launch tube. The missile **12** is mounted within the launch tube within a pair of bearings **14** and **16.** The forward bearing **16** is provided with four outwardly extending fins **18, 20, 22** and **24** which ride in slots provided in rails **26, 28, 30** and **32** respectively formed within the launch tube in the manner illustrated in FIG. **3.**

In the missile **12,** illustrated in FIG. **1** as representing the prior art, the rear bearing **14** is mounted adjacent the rear end of the missile and the forward bearing **16** is mounted adjacent the mid point of the missile. When a missile mounted in this manner is spun above 7,000 or 8,000 revolutions per minute, the missile due to residual dynamic imbalance tends to bend in the manner illustrated by the dotted line **40** thus displacing the longitudinal axis of inertia of the missile at an angle to the longitudinal axis of the launcher. When this occurs, and the missile is launched, the missile will assume a flight path dictated by the longitudinal axis of inertia which will be different from the direction indicated by the attitude of the launch tube.

Referring now to the missile of the present invention as illustrated in FIG. **2,** the bearings **14** and **16** are moved to the node points for the bending mode of the missile and the missile will bend to the position illustrated by the dotted line **42.** Since the bearings **14** and **16** are mounted at the bending nodes, the longitudinal axis of inertia of the missile will not deviate from and will be coincident with the longitudinal axis of the launcher so that when the missile exits from the launcher it will continue on the flight path indicated by the attitude of the missile launcher.

From the foregoing description it may be appreciated that mounting of the bearings **14** and **16** at the node points of the missile much higher spin rates may be employed for the missile without causing deviations of the missile flight path from the desired flight path due to the bending of the missile caused by centrifugal forces at extremely high spin rates.

I claim:

1. In combination with a launch tube having a rear smaller diameter portion and a forward larger diameter portion,

a spin stabilized missile having two ball bearing assemblies mounted thereon,

each of said bearing assemblies comprising an inner and an outer race and a series of balls therebetween,

the inner race of the rearmost bearing assembly being mounted on said missile at the rear bending node of the missile and the outer race bearing against the wall of the smaller diameter rear portion of said launcher,

a plurality of longitudinally extending slotted rails mounted in the forward larger diameter portion of said launcher,

the inner race of the forward bearing assembly being mounted on said missile at the forward bending node of said missile,

fins attached to the outer race of said forward bearing assembly and slideably received in the slots in said rails,

whereby the support being at the node points wherein there is no movement relative to said launcher the missile principal longitudinal axis of inertia will remain coincident with the longitudinal axis of the launcher regardless of any bending of the missile induced by rotation thereof.

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