

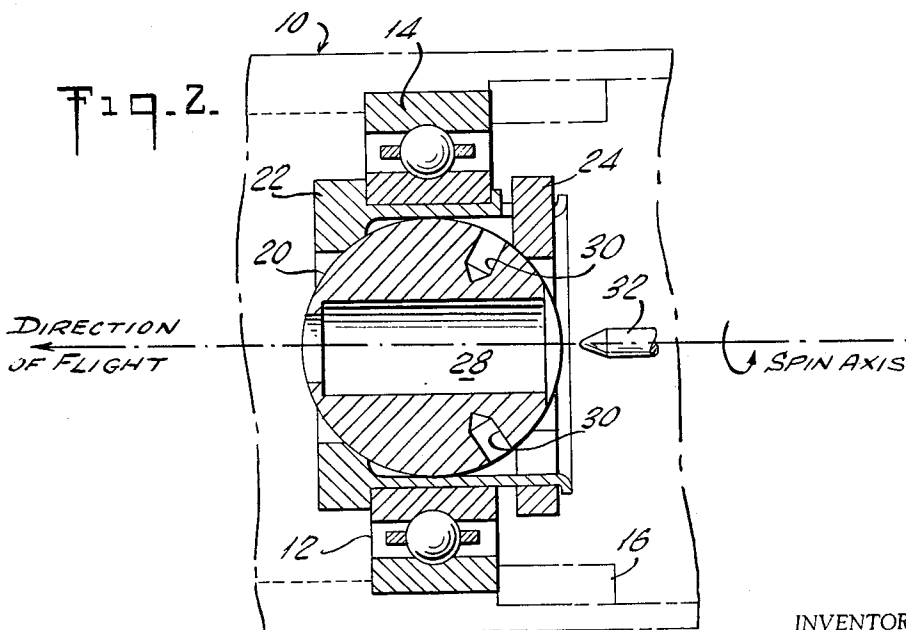
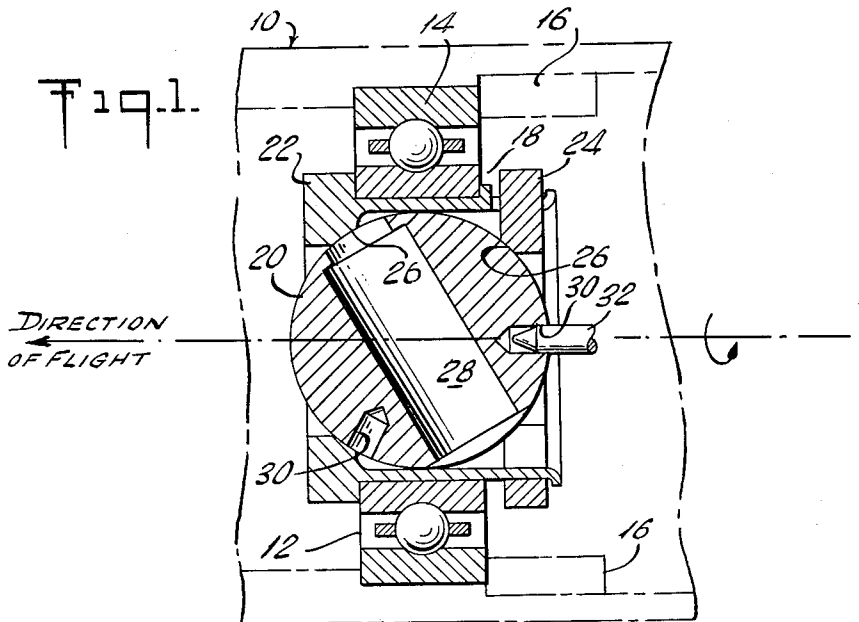
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DELAYED ARMING MECHANISM

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1

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DELAYED ARMING MECHANISM

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2 Claims. (Cl. 102—79)

This invention relates in general to devices for the delayed arming of fused explosive projectiles such as artillery shells, rockets, mortar shells, and the like. More specifically the present invention relates to a novel means and method for increasing the arming time delay of devices operating on a dynamic equilibrium principle.

In one form of known arming device a ball rotor or other inertia mass having a single dynamic balance equilibrium spin axis is employed. Prior to projectile launch, the ball rotor is positioned with its equilibrium axis skew to the spin axis of the projectile in which it is mounted. Upon launch, the spin of the projectile is imparted to the ball rotor which rapidly assumes a similar angular velocity. In a relatively short period of time the dynamic balance equilibrium axis of the ball rotor will precess and become aligned with the spin axis of the projectile and such alignment is sensed to effect arming of the projectile fuse.

The present invention is concerned with a novel mounting means for said inertia responsive ball rotor in the form of a ball bearing which is effective to increase the arming time delay of the device by increasing the time necessary for the alignment of the equilibrium spin axis of the ball rotor with the spin axis of the projectile. Applicants' invention consists essentially of a ball bearing mount for the ball rotor wherein the outer race of the bearing is fixed to the spinning projectile. The inner race is free to spin with respect to the outer race and the ball rotor is mounted therein. A ball support collar and retainer are affixed to the inner race to provide a spherical mounting seat for the ball rotor. The ball is dynamically unbalanced and is normally held in the unbalanced or misaligned position prior to firing of the projectile by a firing pin engaging an indentation therein.

Upon firing, the projectile and outer fixed race of the ball bearing mount spin and the firing pin disengages the ball rotor. The inertia of the free inner race and the parts mounted thereto resist the projectile spin. The torque transmitted from the outer race through the bearing balls to the inner race is relatively small because the rolling ball coefficient of friction is low. Thus, the angular velocity of the inner race is much smaller than the outer race and projectile. Accordingly, the time required for the inner race and the ball rotor to reach the angular velocity of the outer race is inversely proportional to the coefficient of friction of the ball bearing.

Accordingly, it is an object of the present invention to provide a novel delayed arming mechanism employing a

2

dynamically mispositioned inertia mass supported in a ball bearing.

This and other objects and advantages of the invention will become apparent and more fully understood from the following description and drawings in which:

FIG. 1 is a sectional view of the invention in its position prior to projectile firing; and

FIG. 2 is a cross-sectional view of the invention showing the relation of the elements after they have attained dynamic equilibrium.

Referring to the drawings, a projectile 10 is diagrammatically indicated having a direction of flight and axis of spin as shown. A ball bearing 12 includes an outer race 14 fixedly mounted to the projectile casing by a retaining ring 16. The inner race 18 of the ball bearing 12 carries a collar 22 and locking ring 24 which cooperate to mount a ball rotor 20 upon their spherical seats 26.

The ball rotor 20 includes a cylindrical bore 28 extending therethrough, and a pair of symmetrically placed apertures 30 in the surface thereof.

As shown in FIG. 1, a firing pin 32 engages one of the apertures 30 to fixedly position the ball rotor 20 in a dynamically unbalanced position. In other words, as shown in FIG. 1, the dynamic balance spin axis of the rotor 20 extends through the central axis of the bore 28 which is out of alignment with the spin axis and direction of flight of the projectile.

Upon firing of the projectile, the firing pin 32 is withdrawn from the aperture 30 and the spin of the projectile casing is effective to impart some of its angular velocity through the bearing balls to the inner race 18 and in turn to the ball rotor 20. As the ball rotor gradually approaches the angular velocity of the projectile, its dynamic equilibrium spin axis will gradually precess until it coincides with the spin axis of the projectile. This novel mounting thereby provides a large time delay for the ball rotor to achieve dynamic equilibrium in comparison to prior art devices wherein the inertia responsive mass is attached directly to the projectile casing.

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

We claim:

1. A delayed arming device for a spinning projectile comprising rotatable means having a dynamic balance equilibrium spin axis, means for positioning said spin axis oblique to the spin axis of said projectile, and means for mounting said first mentioned means to said projectile, said mounting means including means for gradually introducing the spin of the projectile to the rotatable means thereby increasing the time required for the rotatable means dynamic balance equilibrium spin axis to become aligned with the spin axis of the projectile.

2. A device according to claim 1, wherein said last mentioned means includes an anti-friction ball bearing.

No references cited.