United States Patent [19]

Jones et al.

[11] **3,776,140**

[45] **Dec. 4, 1973**

[54] **SHOT VORTEX ARMING DEVICE**

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[22] Filed: **Nov. 22, 1971**

[21] Appl. No.: **201,232**

[52] **U.S. Cl.** ..... **102/70.2 R**, 102/78, 102/79

[51] **Int. Cl.** **F42c 15/26**

[58] **Field of Search** ..... 102/79, 80, 81, 78, 102/70.2 R

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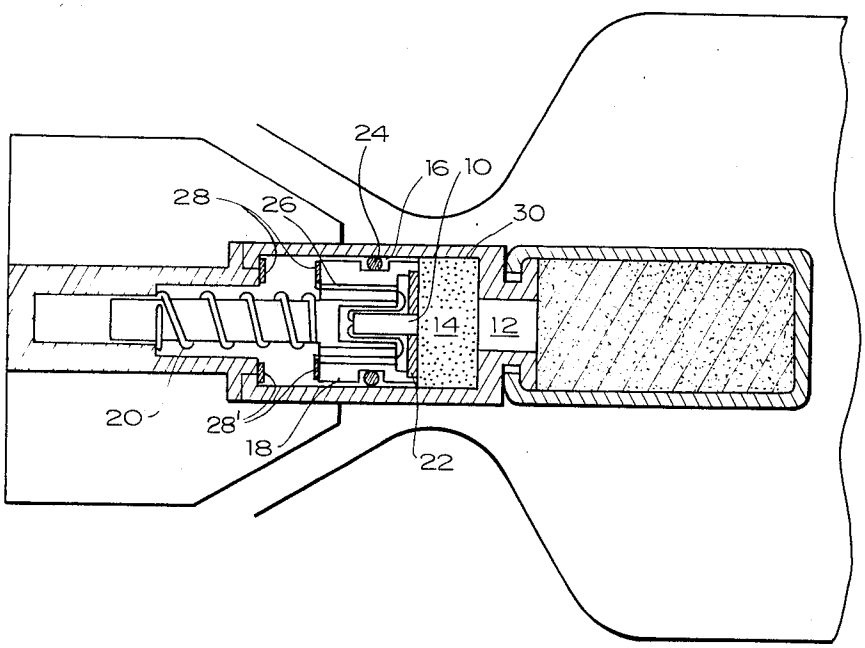
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[57] **ABSTRACT**

A safety-arming mechanism which senses spin and acceleration. The mechanism has a particulate material as a barrier between initiator and acceptor explosive charges. The particulate material is freed by acceleration causing set back of a piston, whose travel is retarded by pressure build up on one side of the piston. Spin forces the particulated material outwardly creating a cavity or vortex through the center and allowing transmission of an explosive reaction.

2 Claims, 5 Drawing Figures



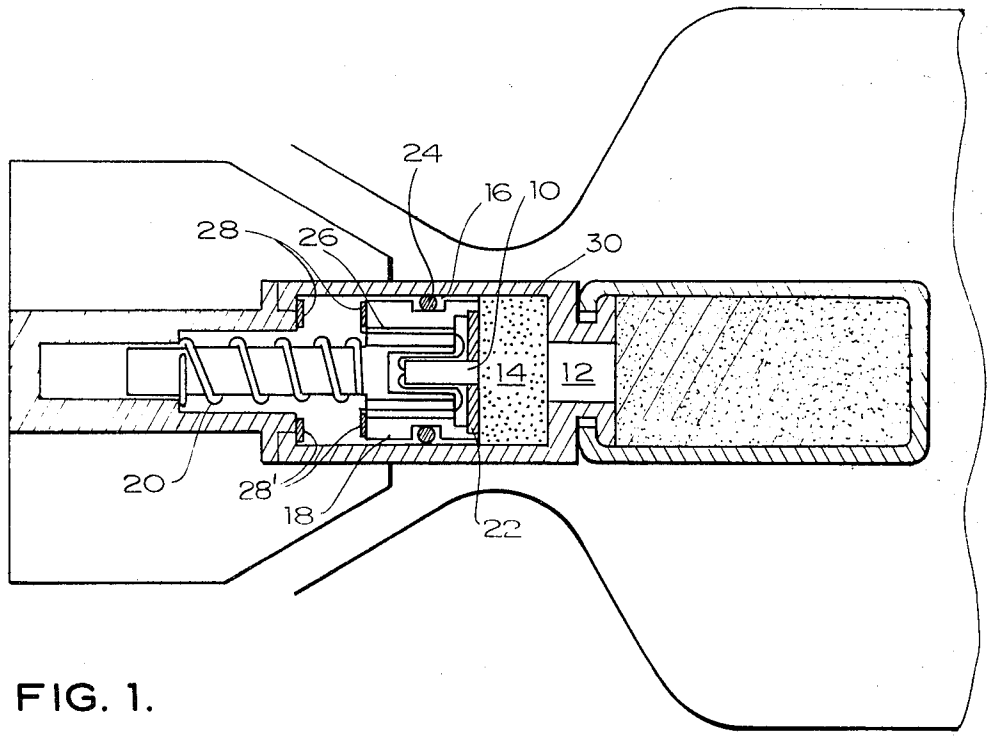


FIG. 1.

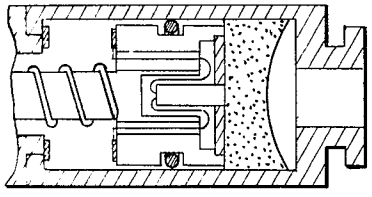


FIG. 2a.

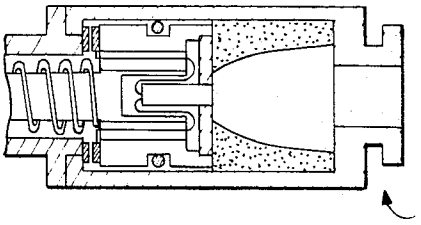


FIG. 2c.

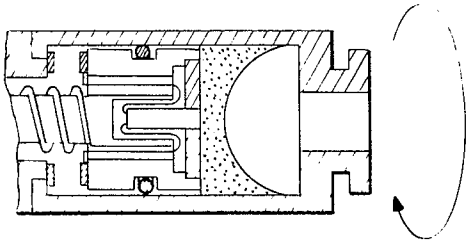


FIG. 2b.

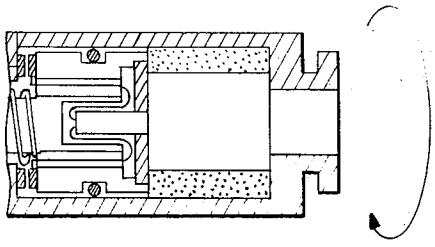


FIG. 2d.

SHOT VORTEX ARMING DEVICE

BACKGROUND OF THE INVENTION

This invention pertains to safety-arming mechanisms.

In the past, devices employed to perform the function of the present invention necessitated the use of systems of mechanical latches and unbalanced members. As a result, the performance of these previous devices was limited by material strength, machine finishes and mechanical tolerances. These are inherently more complex devices and thus more costly and more susceptible to failure than is the present invention.

SUMMARY OF THE INVENTION

The present invention is a safety-arming mechanism for use in the second stage ignitor of a dual stage rocket. The invention has a particulate material such as lead shot for a barrier between the initiator and acceptor explosive charges. The invention is sensitive to spin and acceleration. The particulate material is freed by acceleration causing set back of a piston which increases the volume in which the particulate material is contained. The spin of the missile centrifugally forces the particulate material outwardly creating a cavity or vortex through the center of the barrier, thus allowing transmission of an explosive reaction.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a cross section of the invention taken through the longitudinal axis; and

FIGS. **2***a*, *b*, *c* & *d* are partial cross sections of the invention taken through the longitudinal axis showing the arming progression.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** shows the invention as it would appear in a second stage rocket motor. In this view the invention is in the safe position. The invention includes an electric squib **10** and a first fire charge **12** separated by a barrier of particulate material **14** such as lead shut, steel balls or glass beads. The particulate material is held in place by piston **18** urged forward by spring **20.**

The head of the piston contains a disc shaped sintered metal air flow restrictor **22** in the center of which sits squib **10.** A rubber O ring **24** located around the periphery of piston **18** is employed to maintain a seal between the piston and cylinder wall so that as the piston moves rearwardly due to acceleration of the rocket, passage of air from the back of the cylinder towards the front is allowed only through air passage **26** and air flow restrictor **22.**

In operation, when the missile is subjected to acceleration sufficient to overcome bias spring **20,** the piston begins to move aftward at a rate controlled by the porosity of air flow restrictor **22.** Since the rocket is also spinning, the forward surface of the shot will begin to assume a parabolic shape as shown in FIG. **2***a*. As acceleration continues and spin rate increases this parabola becomes more and more acute until a vortex cavity is opened allowing an explosive reaction to pass through the cavity. When the piston is at its most aftward position, switch contacts **28 28** connect squib **10** to the electronics assembly of the missile.

If initiation does not occur before acceleration ceases, the shot realigns itself in the form of a cylinder as shown in FIG. **2***d* thus locking the device in the armed position as long as the device is spinning sufficiently. When spin decays, the shot falls back into chamber **30** and the bias spring forces the device back to the safe position.

What is claimed is:

1. A safety-arming mechanism for a guided missile which senses spin acceleration comprising:

an igniter;

an explosive charge;

said igniter and said charge being axially aligned;

means for igniting said igniter;

a cylindrical housing defining a chamber between said igniter and said explosive charge;

a barrier of particulate material located in said housing;

a movable piston slidable within said housing and contiguous said barrier material;

a spring biasing said piston in the direction of missile acceleration for urging said material in a closely packed arrangement;

whereby upon launching of the missile the spin and setback forces acting upon the particulate material create a cavity through the center of said housing for the transmission of an explosive reaction.

2. The device of claim **1** wherein said igniter igniting means comprises:

first and second switch contacts;

said first contact being attached to the missile body; and said second contact being attached to said piston means;

whereby said contacts become contiguous upon sufficient acceleration of said missile.

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