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FUZE ARMING SYSTEM

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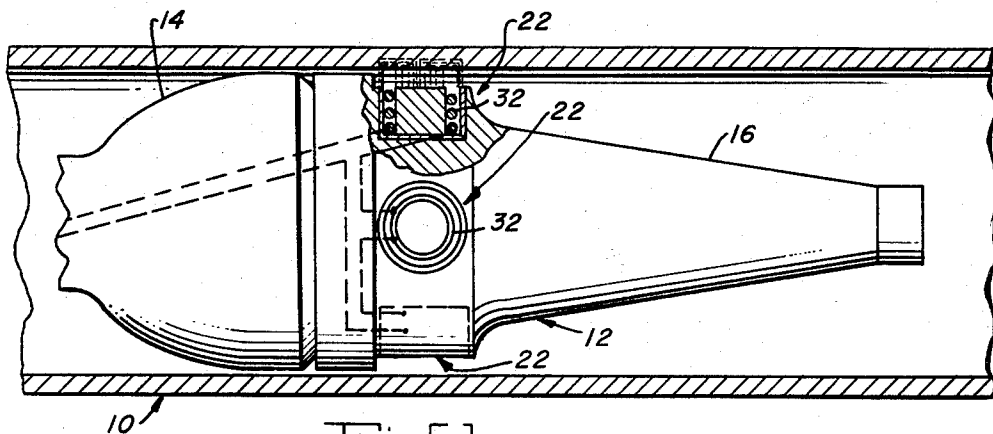


Fig. 1.

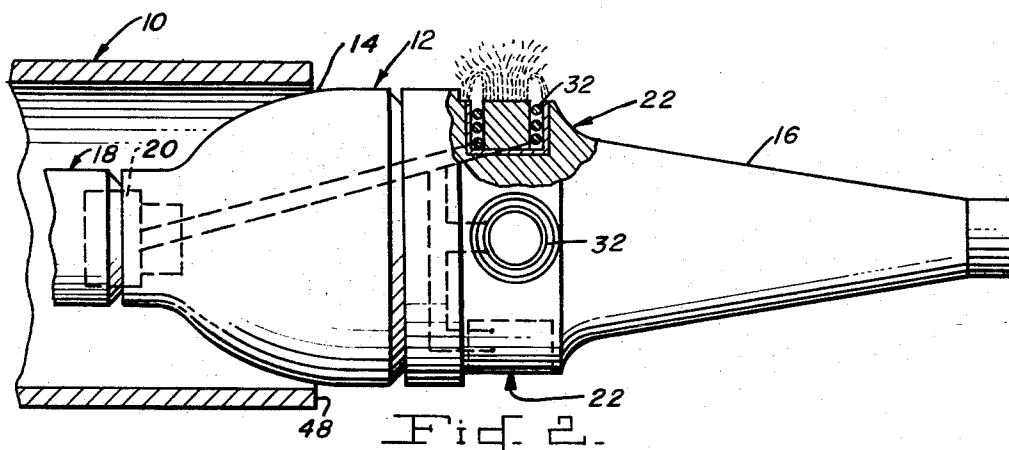


Fig. 2.

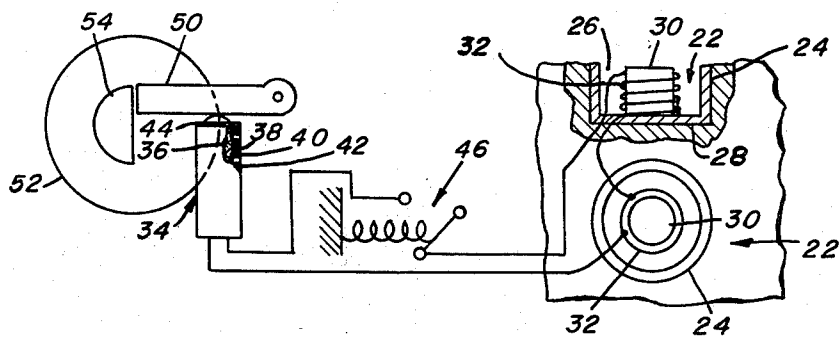


Fig. 3.

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FUZE ARMING SYSTEM

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1 Claim. (Cl. 102—70.2)

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

This invention relates to ordnance fuzes, and more particularly, to a fuze arming system that is adapted to function when a projectile mounting this system is fired from the launcher for which it was designed.

Usual safety devices employed in fuzing systems for ordnance projectiles integrate acceleration; they arm the fuze in response to projectile acceleration of sufficient amplitude that continues for a sufficient time. Because accidental dropping or the like may be sufficient to cause such a device to arm, such devices are often supplemented with auxiliary means for intentional arming. The latter may take the form of a pull-pin or other well-known device, that must be manually released or removed before the projectile is placed in the launcher for firing.

Such secondary safety means have certain disadvantages. They are expensive and difficult to manufacture. They make it difficult to seal the projectile effectively against moisture. They may give projectile handlers an unwarranted feeling of security.

The object of this invention is to provide an arming system that cannot arm in response to accidental acceleration but that will arm automatically in response to firing from a proper launcher.

Another object of this invention is the provision of a dual function arming system that is inexpensive, relatively simple to manufacture, adapted to proper projectile sealing, and superior in performance and inherent safety.

A further object is a fuze arming system that responds to mutually independent energy sources.

Briefly, the present invention may be characterized by a circuit having a coil-magnet assembly that is adapted to generate an energy pulse on leaving a projectile launcher barrel. Simultaneously therewith, or prior thereto, an acceleration responsive device in the circuit will function to close the circuit, thus enabling the energy pulse to fire a pyrotechnic explosive motor or other electrically initiated device such as a relay. This electrically initiated device moves a detonator from a safe to an armed position.

The specific nature of the invention, as well as other objects, uses, and advantages thereof, will clearly appear from the following description and from the accompanying drawing, in which:

FIGURE 1 is a partial longitudinal sectional view of a portion of a projectile having the fuzing system of the present invention in its corresponding launcher barrel.

FIGURE 2 is similar to FIGURE 1 but shows the projectile leaving the launcher barrel during proper launching.

FIGURE 3 is a partially schematic and sectional view showing the essential functional components of the invention.

Referring to FIGURE 1 of the drawing, a projectile launcher barrel 10 is illustrated as containing its properly received projectile or round of ammunition 12. Barrel 10 may be conventionally fabricated and constitute part of a conventional launcher.

Projectile 12, as will appear from the following, may

be a rocket, mortar, artillery round, or a guided missile for the purposes of this invention, but these are by far not exhaustive of the types that may be suitable.

For purposes of the detailed description contained herein and in no sense limiting in nature, projectile 12 is shown as having a rocket configuration. Thus, the rocket head 14, which encases a suitable explosive charge, may have the usual attached nose portion 16 and tail 18. Nose 16 may mount a conventional contact fuze, time fuze or the like to initiate detonation of the contained explosive in head 14. However, as shown in FIGURE 2 a conventional fuze 20, which may be either electrical or mechanical or a combination of both, may be located adjacent the tail end of rocket head 14. Tail 18 may contain the conventional propellant charge and fin assembly (not shown).

The fuze arming system of this invention is shown more clearly in FIGURE 3. A plurality of coil-magnet assemblies 22 are preferably disposed on that portion of projectile 12 that presents the largest or slightly less than the largest external diameter to the bore of barrel 10 (FIGURE 1). Assembly 22 may comprise a substantially cup-shaped magnet 24 having an open end 26 and closed end 28. Extending from closed end 28 either integrally formed therewith or attached thereto and coaxial with magnet 24 is solid shaft or rod 30, which is also magnetic. The free end of shaft 30 terminates at or near open end 26 of magnet 24. Both magnet 24 and magnetic shaft 30 may be permanent magnets but are not restricted to this type as will be evident to those skilled in the art. Suitably wound about each shaft 30 are coils 32 which are effectively located to be cut by the line of magnetic flux set up by magnets 24 and 30.

Coils 32 may be electrically connected in series with a conventional explosive motor 34. Explosive motor 34 may contain, in squib form a known heat-producing pyrotechnic material 36. Surrounding casing 38 for squib 36 may be compressed spring 40 embedded in a low melting point solder 42. One end of spring 40 may bear against or be secured to a displaceable plate 44 which may be affixed to its mating end of casing 38 by a low melting point solder similar to solder 42. The other end of spring 40 may be secured to casing 38 or other stationary means.

An inertia switch 46 of any of the conventional varieties may be interposed electrically in series with motor 34 and coils 32. Switch 46 is designed to remain closed, as for example, against the force of a spring, until the coil-magnet assemblies 22 have passed the open end 48 of the launcher barrel 10. Similar to conventional inertia switches, switch 46 must have been subjected to an acceleration for a certain time before it will close. Consequently, a safeguard is provided against accidental magnetic pickup that can produce undesirable results.

As the coil-magnet assembly 22 passes the end 48 of the launcher barrel 10, a voltage is produced in the arming system of FIGURE 3 because of the change in pattern of the magnetic flux field as is evidenced by contrast of the magnetic fields illustrated in FIGURE 1 and FIGURE 2. This voltage is of such a magnitude, depending upon the number of coil-magnet assemblies 22, that it will fire or initiate the pyrotechnic material 36 of explosive motor 34. The heat generated by material 36 is sufficient to melt the low-melting solder 42 and that solder securing plate 44 to casing 38. Thus, the spring 40 is now free to extend to its unbiased state, and consequently, displace plate 44 from casing 38. Plate 44 may be secured to a mechanical interlock 50, that may be in the form of a rotatable lever, as by soldering, welding, or mechanical fastening. Initially, interlock 50 may be positioned to prevent rotor 52 from moving, as by abutting against a protruding boss 54 of rotor 52. However, when interlock 50 is displaced by

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plate 44, this abutment ceases to exist. Now the rotor may move, as for example, under influence of a spring, to place a detonator (not shown), carried by rotor 52, in line with the functional mechanism of fuze 20 to be in a position to detonate the explosive of rocket head 14. Thus, fuze arming has been safely and efficiently attained.

It will be apparent that the embodiment shown is only exemplary and that various modifications can be made in construction and arrangement within the scope of the invention as defined in the appended claim.

I claim:

1. A fuze arming device for incorporation in a missile and adapted to arm the missile in response to the missile leaving its launcher barrel, said device comprising: a substantially cup-shaped first magnet housed in the body of said missile, said first magnet having its longitudinal axis substantially perpendicular to the axis of said missile, said first magnet having an open and a closed end, the extremities of said open end being substantially flush with the outer surface of said missile body; a cylindrical second magnet within said first magnet, said second magnet being substantially coaxial to the longitudinal axis of said first magnet, one end of said second magnet being affixed to the inner wall of said closed end of said first magnet, the other end of said second magnet being free and flush with the outer surface of said missile body; a wire coil wrapped in convolutions around said second magnet so as to be intermediate the outer periphery of said second magnet and the inner walls of said first magnet; detonator release means adapted to be activated to release a detonator

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for rotation to an armed position in response to a voltage applied thereto; and switch means responsive to forces of set-back for electrically connecting said coil to said detonator release means when said missile is fired in said barrel; said barrel providing a low resistance magnetic path between said extremities of said first magnet and said free end of said second magnet so that relatively intense and constant magnetic field exists in said second magnet while said missile is in said barrel, said magnetic field in said second magnet decreasing rapidly when said missile leaves the end of said barrel, the rapid decrease of said magnetic field causing a voltage to be induced in said coil which activates said detonator release means, thereby arming said missile.

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