Jan. 3, 1961 J. F. TOOMEY 2,966,857

ELECTRIC FUZE, MAGNETIC IMPULSE GENERATOR

Filed June 1, 1959

Fig. 1.

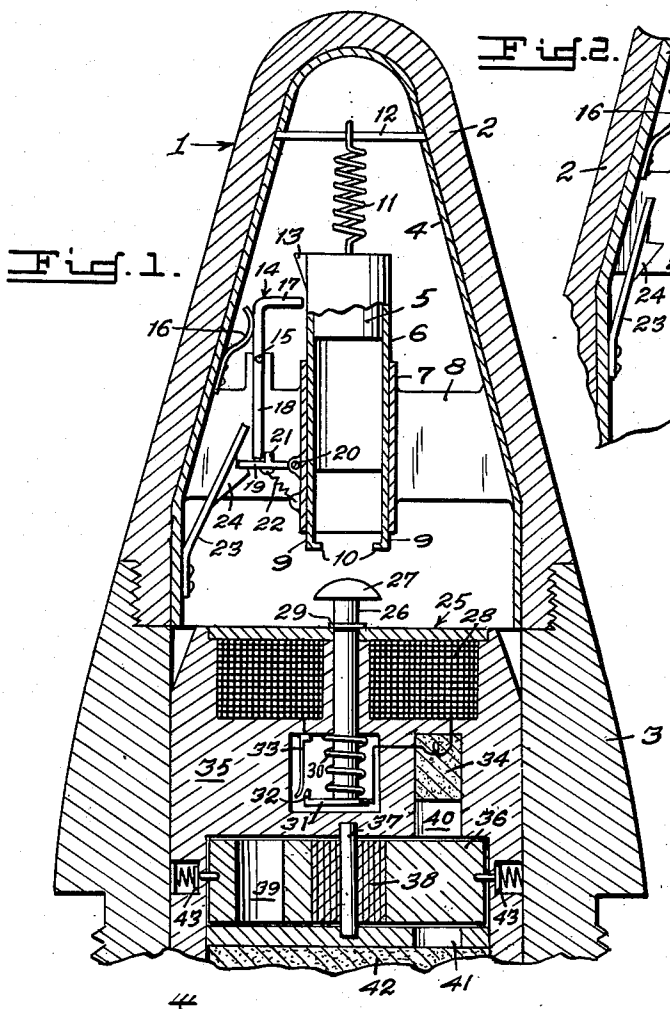


Fig. 2.

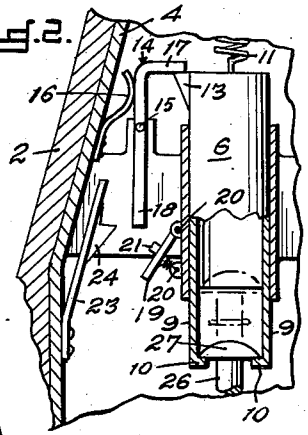


Fig. 3.

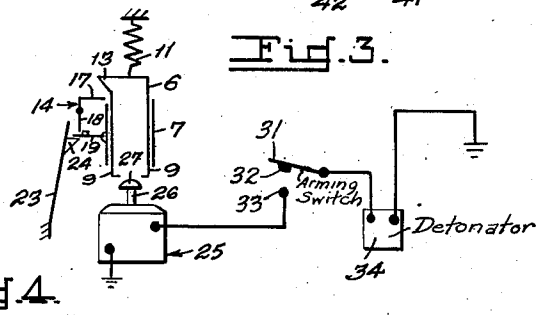
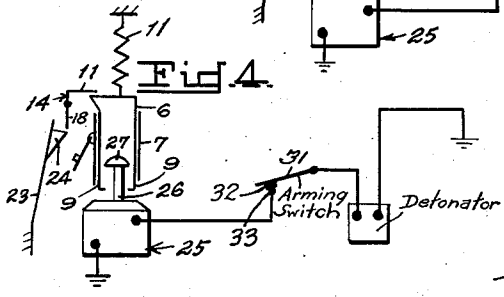


Fig. 4.



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ELECTRIC FUZE, MAGNETIC IMPULSE GENERATOR

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3 Claims. (Cl. 102—70.2)

This invention relates to an electric fuze for attachment to a projectile and more particularly to a self-destruction mechanism therefor which is initiated by acceleration and centrifugal forces.

The present invention utilizes the energy created upon projectile setback and spin to initate operation of a self-destruction mechanism incorporated in the fuze and this is accomplished by a combination spring loaded cylinder and weight member which is forced rearwardly upon setback to engage an extension of an armature of a magnetic impulse generator and is held in a cocked position by a tripping lever. A spin responsive leaf spring moves outwardly upon projectile spin to release a stop member which normally prevents the tripping lever from releasing the cylinder and weight member. At the same time a rotor element will be released to rotate to an armed position by action of a pair of spin actuated detents which move outwardly to release the rotor and arm the fuze.

In case of a target miss, the fuze will function to destroy itself. The spin responsive spring will, upon cessation of centrifugal force move inwardly and urge the tripping device to release the cylinder and weight member to move the generator and initiate firing of the fuze.

An important object of this invention is to provide a fuze utilizing the energy created by setback and centrifugal forces to initiate its self-destruction.

Another object of the invention is to provide self-destruction of a fuze upon cessation of projectile spin.

A further object of the invention is to provide self-destruction means for a fuze that is completely automatic in operation.

A still further object is to provide a device capable of destroying a fuze upon target miss that is reliable and economical in construction.

The specific nature of the invention, as well as other objects and advantages thereof, will be apparent from the following description of the preferred embodiment thereof as illsutrated in the accompanying drawings, forming part of the specification, in which like numerals are used to designate like parts throughout the same.

In the drawings:

Figure 1 is an axial sectional view taken through a fuze of the invention and illustrating the operating elements in their unarmed position;

Figure 2 is a fragmentary sectional detail and showing the elements in cocked position;

Figure 3 is a wiring diagram, the elements being in unarmed position as in Figure 1; and,

Figure 4 is a view similar to Figure 3, the elements being shown in cocked position as in Figure 2, and the armature of the magnetic generator moved forward upon projectile impact to fire the detonator.

In the drawing:

1 indicates a fuze generally and includes a body composed of a forward section 2 detachably connected to a rearward section 3 for purposes of assembly, the rearward section being adapted for attachment to a projectile (not shown). A supporting housing 4 is fitted in

the forward section 2 and is for the purpose of supporting operating elements of the fuze.

The fuze body 1, sections 2 and 3 and the supporting housing 4, form no part of this invention and merely illustrate one manner of housing and supporting operating mechanism only.

The self-destruction mechanism of this invention is supported by the housing 4 and comprises a weight 5 which is carried in the upper portion of a cylinder 6. Cylinder 6 is slidably mounted in a cylindrical guide 7 which is supported in an axial position with relation to the housing 4 by suitable means such as webs 8. A pair of legs 9 extend rearwardly and are integral with cylinder 6 and are turned inwardly at their lower ends as at 10. The forward end of cylinder 6 is secured to a spring 11 which is secured at its forward end to a suitable support such as a rod 12. A beveled projection 13 is integral with the forward peripheral edge of cylinder 6.

A tripping lever indicated generally at 14 is pivoted as at 15 to the web 8 and is biased toward cylinder 6 by a spring 16 fastened to the inner wall of housing 4. The upper end of lever 14 is turned inwardly as at 17 for engagement with projection 13. The lower leg 18 of tripping lever 14 is normally held against rotational movement by a stop lever 19 pivoted at its inner end as at 20 to guide 7. An upstanding lug 21 integral with the upper side of lever 19 is adapted to prevent counterclockwise rotation of leg 18 when in normal position. Lever 19 is normally biased rearwardly by a spring 22 attached as shown to guide 7. A leaf spring 23 is secured at one end to housing 4 and is provided adjacent its inner forward end with a projection 24 normally engaging under stop lever 19.

Means for detonating the fuze is provided and comprises a magnetic impulse generator indicated generally by 25 and is carried by section 3 of the fuze body. The generator 25 consists of an armature 26 of the permanent magnet tape, having a head 27 slidably mounted within an electromagnetic field winding 28. Armature 26 is provided with a stop 29 to limit rearward movement and a coil spring 30 biasing between winding 28 and an arm 31. An arming switch adapted to complete the firing circuit consists of a contact 32 carried by arm 31 which in turn is fixed on the bottom of armature 26 and is adapted to act as a switch for completing the firing circuit with a contact 33 electrically connected to winding 28. A detonating element 34 is contained in a passage 40 in the housing 35 carried by section 3 and is electrically connected to contact 32 and winding 28. A rotor 36 is mounted on a shaft 37 in housing 35 and may be spring wound as by clock spring 38 and contains a flash passage 39. Rotor 36 is adapted to rotate to align passage 39 with flash passages 40 and 41 to complete the powder train to booster 42, a portion of which is shown in Figure 1.

Generator 25 is shown as one type of magnetic impulse generator that may be employed for use in an electric fuze. Other types of generators may be employed and the generator shown in Figure 1 is for illustration only and to correlate the self-destruction mechanism to the armature of a generator.

Means to prevent accidental rotation of rotor 36 to prematurely arm the fuze is provided and consists of a pair of spring loaded detents 43 which are adapted to move outwardly upon projectile spin to free rotor 36 to rotate to its armed position.

Figures 3 and 4 show the operating elements of the fuze schematically and the wiring diagram showing one form of wiring for conducting the electric impulse to detonator 34. In Figure 3, the fuze is in its unarmed position, while Figure 4 illustrates the "fire" position.

The arm 31 carrying contact 32 acts as the arming switch between contacts 32 and 33. The detonator 34 may be grounded through the winding 28 or by other suitable means, not shown.

Operation

As shown in Figure 1, the fuze is in its unarmed position. Firing of booster charge 42 is prevented due to rotor 36 being held in safe position by detents 43 whereby flash passage 39 is held out of aligment with detonator 34.

Upon setback, cylinder 6 will move rearwardly and the legs 9 with the inturned portions 10 will engage armature 26 and under head 27. The armature is still free to move forwardly upon projectile impact to create an electric impulse to fire detonator 34. In moving rearwardly, the projection 13 on cylinder 6 will ride under inturned portion 17 of lever 14 whereby cylinder 6 is held in its retracted position.

As the projectile starts to spin, centrifugal force will cause leaf spring 23 to move outwardly and stop lever 19 will be released to pivot away from the lower leg 18 of lever 14, lever 14 being urged in its locking position with respect to cylinder 6 by spring 16.

In case of target miss, and upon projectile inertia, spin will cease thus causing leaf spring 23 to return inwardly whereby it urges lever 14 to rotate in a counterclockwise direction so that inturned portion 17 releases cylinder 6 to move forwardly, carrying with it armature 26 by action of spring 11, whereby the firing of detonator 34 initiates destruction of the fuze.

Only one self-destruction mechanism is illustrated in the drawing, but others may be added as necessary for operation of the fuze.

It is to be understood that the form of the invention, herewith shown and described, is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention, or the scope of the subjoined claims.

What is claimed is:

1. An electric fuze for a projectile comprising a body, a housing in said body, an arming rotor in said housing, a detonator in said housing, an electric impulse generator in said housing, said generator including an electro magnetic field winding and an impact responsive armature slidable in said winding, a self-destruction mechanism for said fuze mounted in said body forwardly of and spaced from said generator armature, said mechanism comprising an axially disposed guide fixed in said body, a spring tensioned weight slidably mounted in said guide, a tripping lever pivotally mounted on said guide, a stop lever pivoted on said guide normally restraining said tripping lever against pivotal movement, and a spring member attached at one end to said body, its free end normally restraining said stop lever against pivotal movement, said weight adapted to be moved axially rearward upon projectile acceleration force and engage said armature, said tripping lever acting to hold said weight in said rearward axial position, said spring member adapted to move outwardly upon projectile spin to release said stop member, said spring member moving inwardly upon cessation of projectile spin and rotating said tripping lever whereby said weight is released to move said armature to induce an electric current in said field winding and fire said detonator.

2. An electric projectile fuze comprising a body having an axial line of symmetry, a housing secured in the rearward portion of said body, an electric impulse generator in said housing, said generator comprising an electro magnetic field winding in said housing and an impact responsive generator armature slidably mounted in axial relation in said winding, a detonator in said housing, electrical conductors connecting said winding to said detonator, a self-destruction mechanism for said fuze mounted forwardly in said body and in spaced relation to said armature, said mechanism comprising a cylindrical guide supported in axial relation in said body and in axial alignment with said armature, a cylindrical weight having an integral beveled projection on its supper edge slidably mounted in said guide, spring means normally biasing said weight towards the forward end of said fuze, said weight defining a pair of rearwardly depending resilient legs having inwardly turned portions at their lower ends for engagement with said armature, a tripping lever pivotally mounted adjacent said guide, said lever being turned inward at its upper end to a position normally in the path of said projection on said weight, a spring fixed to said body and normally biasing against the upper portion of said tripping lever, a stop lever having an upstanding projection pivotally mounted on said guide, said projection adapted to prevent counter clockwise rotation of said tripping lever, and a leaf spring fixed at its rearward end to said body, said lever having a projection adjacent its upper end normally engaging under said stop lever, said cylinder weight adapted to move rearwardly upon projectile set back force whereby said legs engage said armature and said tripping lever rides over said beveled projection on said cylinder weight to hold said weight in said rearward position, said armature being free to move forwardly in said cylinder upon projectile impact, said leaf spring moving outwardly upon projectile spin to release said stop lever from said tripping lever, said leaf spring moving inwardly upon cessation of said spin to rotate said tripping lever in a counterclockwise direction to free said cylinder weight to move said armature forwardly to fire said detonator.

3. An electric projectile fuze comprising a body, a housing secured in said body, an electric impulse generator in said housing, said generator including an electro magnetic field winding and having an axially slidable armature in said winding, there being a head on the forward end of said armature, a rotor in said housing, a detonator in said housing, a booster charge in said housing and electrical contact means carried by said armature adapted to complete an electrical circuit between said generator and said detonator, a self-destruction means housed in said body forwardly of said generator, said means comprising a supporting means fixed in said body, a set back responsive member slidably mounted in said supporting means and in axial alignment with said armature, spring means normally urging said set back member forwardly in said body, a tripping member pivotally mounted adjacent said set back member, spring means normally urging said tripping member towards said set back member, a stop member pivotally mounted on said supporting means, normally restraining said stop member against counterclockwise rotation, spring means normally biasing said stop member from said tripping member and a centrifugal force responsive member fixed to said body adapted to maintain said stop member against rotation, said set back member moving rearwardly to engage said head or said armature and to be held rearwardly by said tripping member upon projectile set back force, said centrifugal force member adapted to release said stop member for rotational movement upon projectile spin whereby said tripping member is freed for rotation, said centrifugal force member rotating said tripping member upon cessation of projectile spin to release said set back member to move forwardly to move said armature whereby an electric impulse is set up to fire said detonator.

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