Dec. 6, 1960  A. G. NEUWIRTH, JR., ET AL  2,962,968

CENTRIFUGALLY ARMED AND SELF-DESTROYING IMPACT FUZE

Original Filed Sept. 21, 1955

INVENTORS
Alois G. Neuwirth, Jr.
By Parke H. Thompson

L. J. Rotondi & A. J. Diament
CENTRIFUGALLY ARMED AND SELF-DESTROYING IMPACT FUZE

Alois G. Neuwirth, Jr., St. Louis County, and Parke H. Thompson, Kirkwood, Mo., assignors to the United States of America as represented by the Secretary of the Army


2 Claims. (Cl. 102—71)

This application is a division of application Serial Number 535,773, filed September 21, 1955, and now Patent Number 2,924,176.

This invention relates to fuzes for spin type projectiles.

An object of the invention is to provide a fuze which is positively held in an unarmed position until it develops sufficient spin in flight to move weighted detents, under the influence of centrifugal force, to a position whereby a firing pin is caused to move from unarmed to armed position by movement of the detents.

Another object of the invention is to provide a fuze having a nose cap of frangible material insuring rapid detonation thereof on impact with a target constructed of easily penetrated materials.

A further object of the invention is to provide a fuze which will detonate on decay of spin if the projectile penetrates a target without detonation on impact therewith.

Other objects and advantages will be apparent from the following detailed description and the accompanying drawings in which:

Fig. 1 is a longitudinal sectional view of a fuze disclosing one form of the invention.

Fig. 2 is a transverse sectional view taken on the line 2—2 of Fig. 1 and looking in the direction of the arrows, Fig. 3 is a longitudinal sectional view of the nose cap insert shown in Fig. 1, and Fig. 4 is a detail perspective of one of the detents shown in Fig. 1.

Referring now to Figs. 1 through 4 of the drawings, the fuze is formed with a body portion 1 rotatable about a longitudinal axis and carrying a booster charge 2. The body portion has an internal cavity 3 in which a generally spherical rotor 4 is movable from a safe to an armed position under the influence of centrifugal force. The rotor has a primer charge 5 fixed within a diametral bore therein and a recess 6 formed in its surface as will be clear from Fig. 1. A firing pin 7 is slidable in coaxial alignment with the axis of the fuze body and engages in the recess 6 to maintain the fuze unarmed by holding the primer charge 5 out of alignment with the firing pin 7 and booster charge 2. In its forward face the body portion 1 is formed with a bore 8 in which is seated the diametrically reduced end 9, of an insert 10, for limiting the rotor 4 to rotation only in the cavity 3. For this purpose it will be noted that body 1 and insert 10 have cooperating recesses 1a and 10a, respectively, fitting smoothly about the corresponding surfaces of the rotor. A nose cap 11 of thin material envelops the insert 10 and the forward part of the fuze body 1 and is secured thereto as at 12 by any suitable means such as rolling. The insert is formed with an axial bore 13 and a coaxial counterbore 14 providing a shoulder 15 at their juncture. A head 16 is secured on the forward end of the firing pin 7 and slides in the bore 13 to guide the forward end of the firing pin in axial translation. An annular enlargement 17 forming a shoulder is formed on the firing pin near its rear end. A generally, hollow, frusto-conical first spring housing 18 surrounds the firing pin 7 and has formed thereon a base flange 19 seated against the shoulder 15.

As clearly shown upon Fig. 1, this housing extends rearwardly into counterbore 14. A first spring 20, within the first spring housing 18 and surrounding the firing pin 7, is confined between the closed end of the housing 18 and the firing pin head 16 for normally urging the firing pin forward. Surrounding the first spring housing 18 and slidably in the counterbore 14 is a second spring housing 21 shown as generally cylindrical in form and enclosing a second spring 22. The second spring housing is diametrically reduced at its rear end as at 23, to engage the annular enlargement 17 on the firing pin 7 and houses the second spring 22 bearing at its forward and rearward ends upon flange 19 and reduced end 23 of the second housing, respectively. The second spring 22 is of greater strength than spring 20 so that the parts are normally maintained in the position shown upon Fig. 1, with the tip of firing pin 7 seated in recess 6 of rotor 4. It will be noted that the enlargement 17 on the rear end of the firing pin, in conjunction with the reduced end and neck portion of housing 21, define an annular recess.

The insert 10 is formed with longitudinal slots 25 shown as four in number and uniformly spaced around the circumference thereof, Figs. 2 and 3. A detent 26 is positioned in each slot and is dimensioned to have a smooth fit therein. The detents are alike and shaped as clearly shown in Fig. 4, to provide finger 27 which contact with an abutment 24 on the second spring housing 21. Each detent is confined for movement within its respective slot 25 by the side wall of the nose cap 11 and the front face 29 of the body portion 1, and is formed with a pointed end 28 about which the detent is outwardly pivotable under the influence of spin to the dotted line position shown upon Fig. 1. In this form of the invention all four detents constantly engage the abutment 24.

The operation of the device shown in Figs. 1 through 4 is as follows:

When a projectile, to which the fuze is attached, rotates in flight the detents 26 move outwardly in response to centrifugal force. The mass center of each detent is well forward of its pivot point 28. Consequently each detent will move powerfully outwardly to the dotted line position, Fig. 1. During this movement the fingers 27 bear against the annular abutment 24 and move the second spring housing 21 forwardly compressing the second spring 22 and freeing the firing pin 14 for forward movement under the bias of the first spring 20 to armed position.

When the rear end of the firing pin is withdrawn from the recess 6 in the rotor 4, the rotor precesses in response to spin of the projectile until the primer 5 is coaxially aligned with the firing pin in fully armed position.

If a hit is made on a target the forward end of the nose cap 11 and insert 10 will be deformed and the firing pin will be forced into the primer 5. In the event that the target is too frail to deform the nose cap and insert, and the projectile continues beyond the target, eventual decay of spin will correspondingly lessen forward thrust of the detent fingers 27. In such an event the spring 22 will overcome the restricted travel of the detent fingers and the bias of spring 20, and will drive the second sleeve 21 and its reduced end 23 against the shoulder formed by the enlargement 17 on the firing pin and detonate the primer charge 5.

Having now fully disclosed the invention, what we claim and desire to secure by Letters Patent is:

1. In an impact detonated fuze having a rotatable body portion, a nose cap secured on the front end thereof, an insert in said nose cap, a centrifugally operated rotor having an ignition charge and a recess therein and being mov-
able from a safe to an armed position, an axially disposed firing pin having a front and rear end and being slidable in said insert said firing pin having its rear end engaged in the recess, said firing pin being formed with an annular shoulder, a first spring surrounding said firing pin for urging said firing pin to armed position, a sleeve slidably in said insert and surrounding said firing pin, said sleeve being formed with an annular abutment and a diametrically reduced portion in contact with the annular firing pin shoulder, a second spring in said sleeve adapted for maintaining said first spring under compression and retaining said firing pin in engagement with the recess, and a plurality of centrifugally operated cam levers, each pivotable at one end thereof on said body portion and having the other end in engagement with the annular abutment of said sleeve, said levers each having the center of mass thereof forwardly disposed in relationship to the pivot end thereof, whereby under the influence of spin said levers will retract said firing pin to an armed position against the bias of said second spring.

2. In an impact detonated fuze having a rotating portion, a nose cap secured on the front end thereof and having an insert therein, a centrifugally operated rotor having an ignition charge and a recess therein and being movable from a safe to an armed position, an axially disposed firing pin having one end engaged in the recess and having an enlargement thereon forming a shoulder near said one end and a head secured to its other end and slidable in said nose cap insert, a first spring housing surrounding said firing pin, a first spring for normally urging said firing pin forwardly, a second spring housing slidable in the insert and having a diametrically reduced rear end engaging the firing pin shoulder and forming an abutment, a second spring within said second spring housing for normally urging said firing pin rearwardly against the bias of said first spring, and a plurality of centrifugally operated cam levers each pivotable at one end on said body portion and having the other end thereof in engagement with the annular abutment of said sleeve, and said levers each having the center of mass thereof forwardly disposed in relationship to the pivot end thereof, whereby under the influence of spin said levers will retract said firing pin to armed position against the bias of said second spring.

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