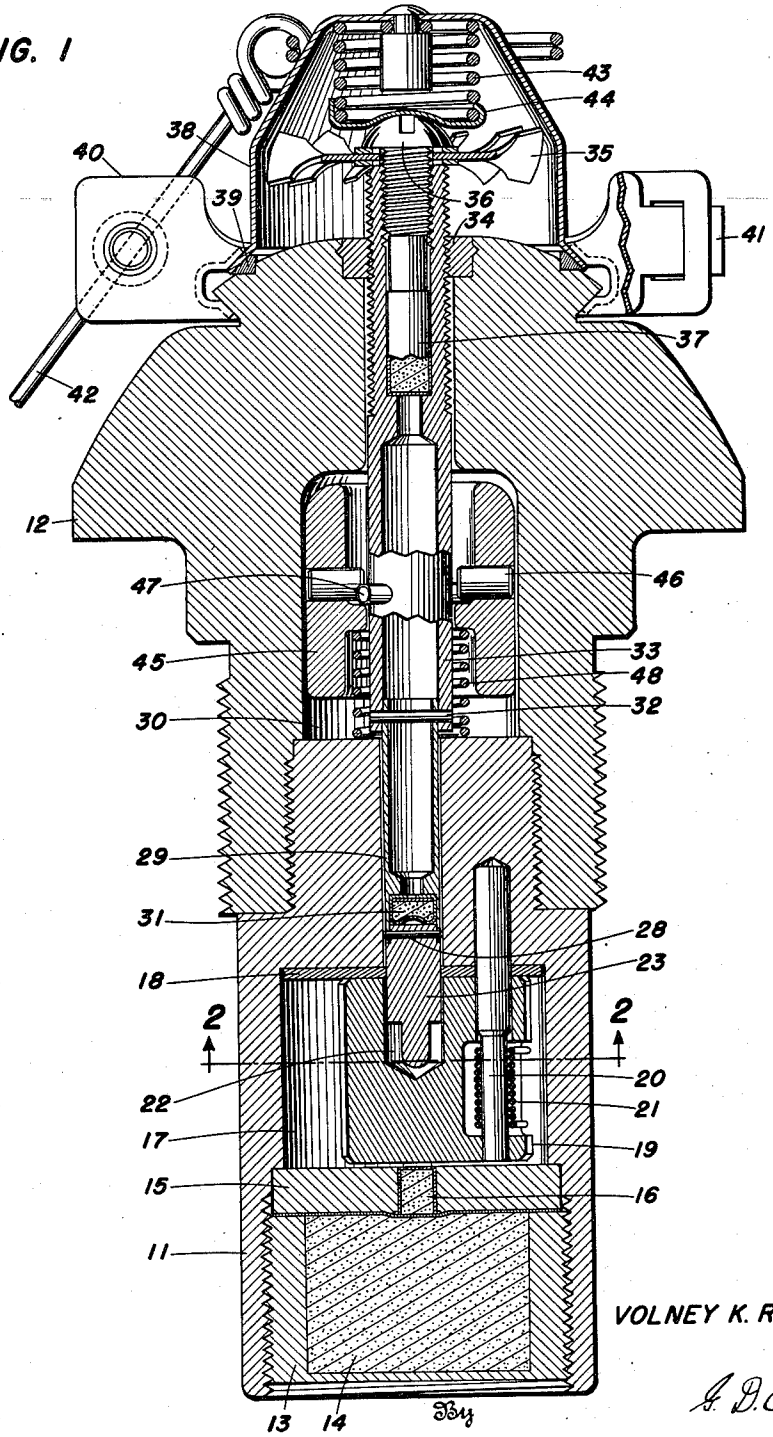
March 13, 1951 V. K. RASMUSSEN 2,544,860

ROCKET FUSE

Filed Aug. 1, 1947 2 Sheets-Sheet 1

FIG. 1



Inventor

VOLNEY K. RASMUSSEN

By

G. D. O'Brien

Attorney

March 13, 1951 V. K. RASMUSSEN 2,544,860

ROCKET FUSE

Filed Aug. 1, 1947 2 Sheets-Sheet 2

FIG. 2

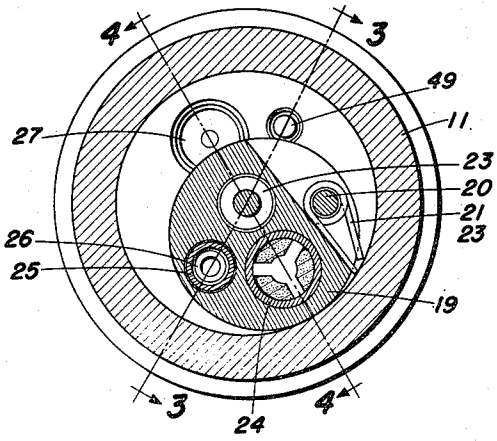


FIG. 3

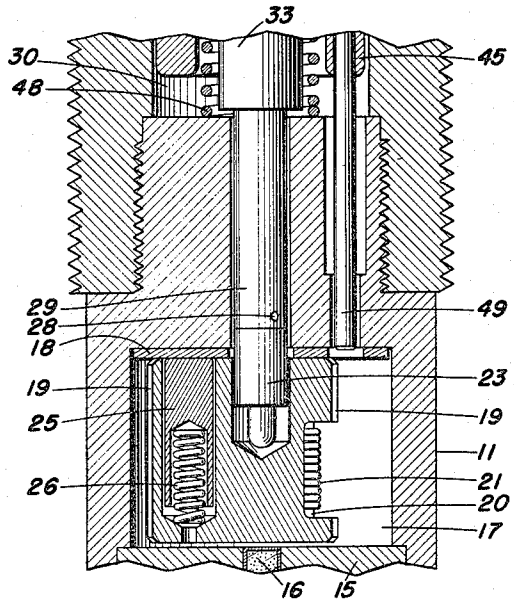
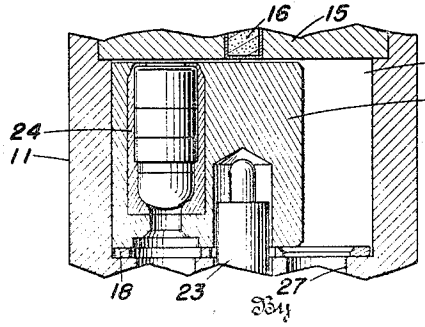


FIG. 4



Inventor

VOLNEY K. RASMUSSEN

By F. D. O'Brien

Attorney

Patented Mar. 13, 1951 2,544,860

UNITED STATES PATENT OFFICE

2,544,860

ROCKET FUSE

Volney K. Rasmussen, Pasadena, Calif., assignor to the United States of America as represented by the Secretary of the Navy

Application August 1, 1947, Serial No. 765,413

2 Claims. (Cl. 102—81.2)

1

The present invention relates to fuzes, for military missiles, more particularly to air arming impact firing fuzes.

While primarily intended for use in rockets, the fuzes described herein can readily be adapted for use in mortar projectiles, torpedoes and other types of projectiles.

Among the objects of this invention are:

To provide a fuze in which an initiating detonator is moved outside the main body of a projectile to arm the fuze.

To provide a fuze which functions regardless of the angle of impact, of the projectile with the target.

To provide a fuze in which the firing pin is always driven toward the final detonator with sufficient momentum regardless of the velocity of the projectile at the moment of impact with the target.

To provide an improved fuze which will not function on striking the surface of water but will on impact against a solid object.

To provide an improved delayed action fuze.

To provide a rocket fuze of this type wherein irrespective of the force with which the fuze may strike its target, a substantially uniform impulse is imparted to the firing pin which initiates the delay element thereby minimizing malfunctioning of the delay element.

To provide a rocket fuze of this type wherein a detonator at the nose of the fuze is set off on impact to fire a primer assembly which in turn fires with pre-determined force thereby imparting the desired force to the firing pin, these events occurring before appreciable mechanical damage to the fuze can occur.

To provide a rocket fuze which is inherently safe and foolproof so that the possibilities of premature firing are reduced to a minimum.

In the accompanying drawings:

Fig. 1 is a longitudinal, sectional view of the fuze shown with the parts in their initial positions.

Fig. 2 is a transverse sectional view thereof taken through 2—2 of Fig. 1.

Fig. 3 is a fragmentary sectional view taken through 3—3 of Fig. 2.

Fig. 4 is a fragmentary sectional view taken through 4—4 of Fig. 2.

The fuze includes a cylindrical body 11, externally threaded at one end to receive a nose piece 12. The other or inner or rear end of the body is provided with a socket which is internally threaded to receive a booster case 13 which contains a booster pellet 14 and serves to hold a

2

partition disc 15 in place. The partition disc 15 contains an igniter 16 and forms a wall of shutter compartment 17. A shutter plate 18 lines the forward end of the compartment 17 opposite from the partition disc 15.

Within the compartment 17 is mounted a shutter 19 which is in the form of a cylindrical block journaled eccentrically by a shutter pivot pin 20 fitting in the head or outer end of the body 11. A pivot spring 21 is so arranged as to exert a force on the shutter 19 tending to move it clockwise about the pivot pin 20 as viewed in Fig. 2. The shutter is provided with a socket 22 which receives a firing pin 23 slidably mounted in a bore extending through the forward end of the body in alignment with the igniter 16. Initially the firing pin holds the shutter in the position shown in the drawings. The shutter is provided with an opening therethrough which receives a delay detonator assembly 24. The opening is so positioned that the delay detonator assembly swings into registry with the firing pin 23 and the igniter 16 when the firing pin 23 is withdrawn from shutter socket 22. A suitable detent 25 backed by a detent spring 26 is positioned to engage in a hole 27 (Fig. 2) provided in the plate 18 when the shutter 19 is in its firing position.

The firing pin 23 is secured by a shear pin 28 to firing pin 29 which extends from the bore in the body 11 into a chamber 30 formed in the nose piece 12. The sleeve 29 is provided adjacent the firing pin 23 with a sensitive primer 31 adapted when ignited to shear the shear pin 28 and drive the firing pin 23 against the delay detonator assembly 24.

The forward end of the sleeve 29 is connected by a securing pin to a tubular arming shaft 33 which extends forwardly through the nose piece 12 and protrudes therefrom. The forward portion of the arming shaft 33 is threaded and fits a nose insert 34 secured in the forward end of the nose piece 12. The forward or top end of the arming shaft 33 carries a propeller 35 which is secured by a retaining screw 36. The retaining screw also serves as a closure for the end of the tubular arming shaft. Inwardly of the retaining screw 36 the arming shaft 33 contains an initiating detonator assembly 37 designed to be fired upon impact with a solid object.

Initially a cap 38 fits over the nose piece 12 and is held against a gasket 39 by means of clamps 40 and 41 which are initially held by an arming wire or safety wire 42. A helical spring 43 attached to the cap 38 is interposed between

the cap and the retainer screw 36 so that when the arming wire 42 is removed and the clamps 40 and 41 freed, the cap is forced off. Bearing plate 44 attached to spring 43 applies the spring pressure to retaining screw 36 to prevent damage to propeller 35.

A tubular set-back pellet 45 is slidably mounted within the nose piece chamber 30 around the arming shaft 33. The set-back pellet is provided with lock pins 46 which extend radially inward; and the arming shaft 33 has stop pins 47 which project radially outward. With the pellet in its forward position, stop pins 47 are engaged by lock pins 46. Return spring 48 urges the set-back pellet forward.

A shutter lock pin 49 extends axially in offset relation with the arming shaft and firing pin sleeve through the head or forward end of the body 11 to a point adjacent the shutter compartment 17. When the set-back pellet is in its forward position, the pin 49 is located forward of the shutter compartment; but when the set-back pellet is in its rear position, the pin 49 projects into the shutter compartment to engage a flat side of the shutter 19 to restrain its movement.

After the fuze has been assembled, the arming shaft 33 is set by turning it counter-clockwise when viewed from the top of Fig. 1 until firing pin 23 jams at the bottom of shutter socket 22 and then backing out the shaft two full revolutions.

Operation of the fuze is as follows:

Initially the parts are disposed as shown in the drawings. Upon firing the rocket, the safety wire 42 is removed permitting the clamps 40 and 41 and the cap 38 to be thrown clear of the fuze by action of the spring 43. During acceleration, the set-back pellet 45 moves against the action of the spring 48. That is, it moves downward as viewed in Fig. 1 to disengage the stop pins 47 of the arming shaft 33. The arming shaft thereupon rotates by reason of the air stream flowing against the propeller 35 and by rotating in threaded engagement with nose insert 34 moves forward to free the firing pin 23 from the shutter 19. The shutter, however, is not permitted to move to its armed position with the delay detonator assembly 24 in alignment with the firing pin 23 and igniter 16 until acceleration of the rocket ceases, for the reason that the set-back pellet maintains the lock pin 49 in its rear or locking position. The propeller 31 continues to rotate and drive the arming shaft 33 forward until the shaft is stopped either by stop pins 47 bearing on the forward wall of chamber 30 or by the unthreaded portion of the arming shaft jamming in the internal threads of nose insert 34. At this point, the firing pin 23 is completely retracted from shutter socket 22 and approximately half of initiating detonator assembly 37 extends forward of the forward face of nose insert 34.

When acceleration ceases or is materially reduced, the spring 48 moves the set-back pellet and shutter lock pin forward thereby releasing the shutter to bring the delay detonator assembly into firing alignment with the firing pin. Upon impact with a solid object whether head on or from the side, the initiating detonator assembly 37 is set off. This detonator assembly is in communication with the primer 31 through the tubular passage afforded in the firing pin sleeve 29 and the arming shaft 33. The forward detonator assembly therefore ignites the primer assembly 31 which produces a predetermined force sufficient to shear the pin 28 and drive the firing pin 23 into the delay detonator assembly 24.

Furthermore the fuze is so designed that it will not fire on water impact but does fire later upon striking a solid object such as a submerged hull. This operation is made possible by the initiating detonator assembly 37 in the arming shaft 33 which is fired by crushing of the exposed end of the arming shaft. Alternatively the fuze may be caused to fire upon impact between retainer screw 36 and a solid object which strips the threads of the nose insert 34 or arming shaft 33. In this case, the arming shaft remains stationary, and the delay detonator assembly 24 continues forward with the projectile until it strikes the firing pin 23 and is actuated thereby. Neither initiating detonator assembly nor the primer is employed when the fuze functions in this manner. Since impact with water will neither crush the arming shaft to detonate the initiating detonator nor strip the threads of either the nose insert or arming shaft, the fuze will not function upon striking the surface of water.

It should be pointed out that the delay detonator assembly 24 must be hit with a rather critical force. If the force is excessive the delay detonator assembly mal-functions by not producing the requisite delay action. If the force is insufficient the delay detonator assembly may not function at all and a dud results. The primer makes possible this rather critical force irrespective of the conditions of impact of the fuze.

Firing of the delay detonator assembly subsequently causes ignition of the igniter 16 which in turn sets off the booster pellet 14 which in turn detonates the explosive bursting charge contained in the rocket.

Although a delayed action fuze has been set forth, an instantaneous fuze may be constructed as readily by substituting an instantaneous detonator in place of the delay detonator assembly 24 in shutter 19.

While the preferred embodiment of the present invention has been described in detail herein, it will be obvious to those skilled in the art that many modifications may be made or equivalents substituted without departing from the true and proper scope of the invention. Accordingly, it should be understood that the present invention is limited only by the appended claims and not by the specific disclosure above.

I claim:

1. A fuze casing having a compartment, a shutter in the compartment having a detonator registrable with an igniter pocketed in the casing, a rotatable screw firing pin initially retracted within the casing and projected into the compartment to obstruct the shutter in a safe position, an inertia pellet having a shutter-lock pin clear of the compartment but directed toward a side of the shutter, a set of stop pins on the firing pin and pellet mutually interengaging to prevent initial rotation of the firing pin, a sustaining spring for the pellet, distancing the shutter-lock pin into clearance from the shutter but yielding upon set-back of the pellet to enable the pellet to free said stop pins and project the shutter lock pin next to said shutter side to augment its obstruction, and means for then rotating the firing pin to extract the firing pin from the chamber, confining the obstruction of the shutter to the shutter-lock pin.

2. A fuze casing having a compartment and a chamber, a shutter in the compartment having a

detonator registrable with an igniter pocketed in the casing, a rotatable arming screw shaft having a firing pin, said shaft being initially retracted within the casing to project the firing pin into the compartment to obstruct the shutter in a safe position, an inertia pellet having a shutter-lock pin clear of the compartment but directed toward a side of the shutter, a set of stop pins respectively on the shaft and pellet mutually interengaging to prevent rotation of the shaft, a sustaining spring for the pellet initially distancing the shutter-lock pin from the shutter, setback movement of the pellet counter to the spring freeing the stop pins for projection of said shutter-lock pin into temporary obstructing position next to the shutter side, said spring reacting on cessation of acceleration to countermove the pellet and displace the shutter-lock pin from the shutter, and means for rotating the screw shaft until its stop pin is stopped by a wall of the chamber, said rotation extracting the firing pin from the chamber to remove the remaining obstruction to movement of the shutter to arming position.

VOLNEY K. RASMUSSEN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,303,197	Hale	May 6, 1919
1,318,954	Barlow	Oct. 14, 1919
1,320,447	Clarke	Nov. 4, 1919
1,531,716	Remondy	Mar. 31, 1925
1,814,059	Rogers	July 14, 1931
2,396,245	Butler	Mar. 12, 1946

FOREIGN PATENTS

Number	Country	Date
325,608	Germany	Sept. 18, 1920
257,335	Great Britain	Aug. 27, 1926