April 28, 1959 R. B. KING 2,883,933

FUZE

Filed May 27, 1946 2 Sheets-Sheet 1

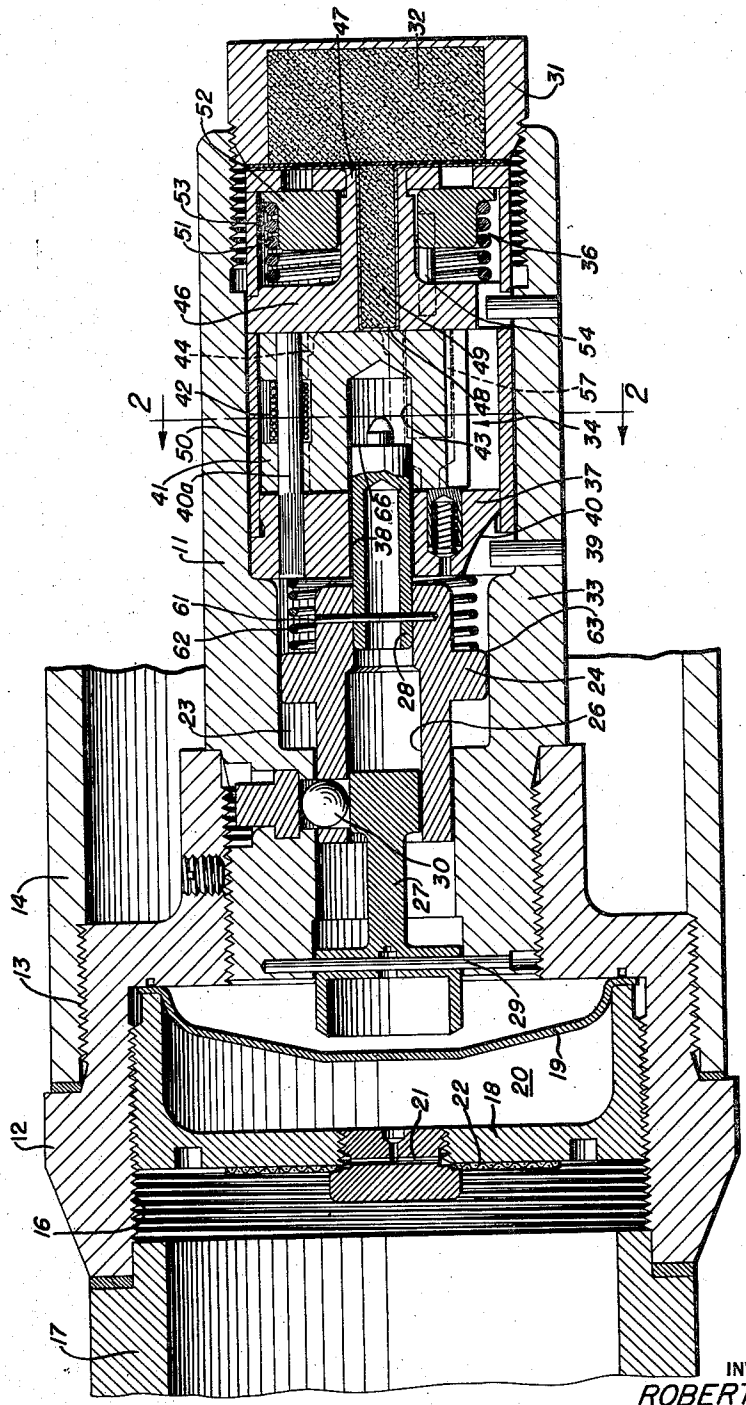

FIG. 1.

INVENTOR
ROBERT. B. KING
G. D. O'Brien
R. M. Hicks
ATTORNEYS

BY

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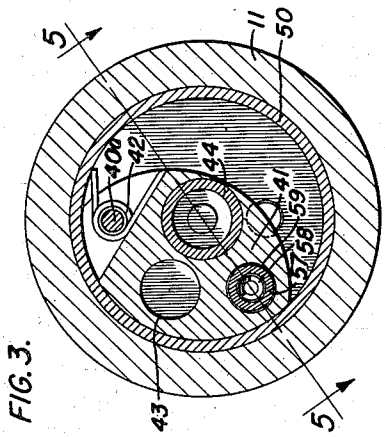

FIG. 3.

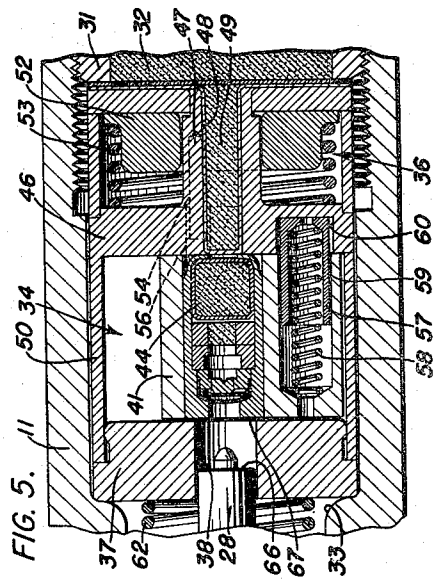

FIG. 5.

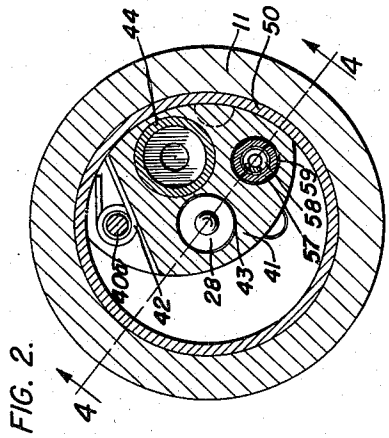

FIG. 2.

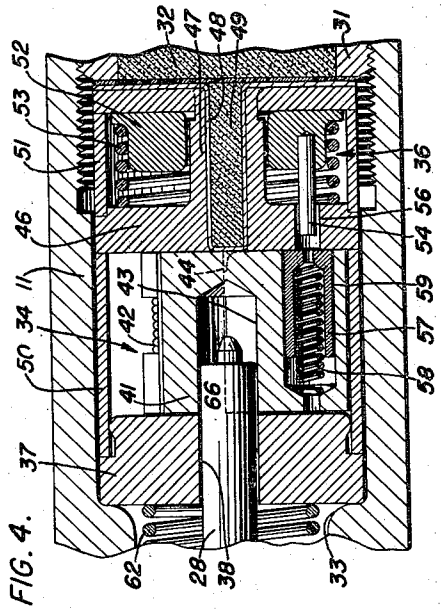

FIG. 4.

INVENTOR
ROBERT. B. KING
G. D. O'Brien
BY R. M. Hicks ATTORNEYS

United States Patent Office

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FUZE

Robert B. King, Altadena, Calif., assignor to the United States of America as represented by the Secretary of the Navy

Application May 27, 1946, Serial No. 672,486

2 Claims. (Cl. 102—81)

This invention relates to fuzes and particularly to base fuzes for rocket projectiles. In a typical installation a fuze of my invention is interposed between the bomb portion and the motor portion of the rocket projectile and utilizes the gas pressure created in the normal operation of the rocket motor for arming. An object of the invention is to provide a rocket projectile fuze of sturdy construction which will arm only under pressure of the gases produced by the combustion of the rocket propellant.

Another object of the invention is to provide a fuze which will arm only after it has traveled a safe predetermined distance from the launching mechanism.

For a more complete understanding of the invention together with other objects and advantages thereof, reference may be had to the following specifications and drawings in which:

Fig. 1 is a longitudinal sectional view through the rocket fuze;

Fig. 2 is a transverse sectional view taken along line 2—2 of Fig. 1, showing the shutter block in its unarmed position;

Fig. 3 is similar to Fig. 2, but shows the shutter block in its armed position;

Fig. 4 is a fragmentary sectional view through line 4—4 of Fig. 2 showing the parts of the fuze as they appear before firing;

Fig. 5 is a fragmentary sectional view similar to Fig. 4 showing the fuze in the armed condition.

The fuze includes a tubular body 11 which is threaded into an adapter fitting 12 having external threads 13 by which the fuze is connected to the rocket body 14, and internal threads 16 to receive the threaded end portion of a rocket motor 17. The rearward end of the adapter fitting is provided with a recess (undesignated) in which is mounted an externally threaded sealing cup 18 the forward edge of which bears against the base of the recess and clamps the margins of a diaphragm 19 against the adapter fitting. The sealing cup 18 and diaphragm 19 define a pressure chamber 20 to which access is had by a meter port 21 which is baffled by a screen 22.

The body 11 is centrally bored to form a cavity 23 for a firing pin sleeve 24, the latter itself having a central bore 26 throughout its length which is adapted to receive at its rearward end an arming plunger 27 and at its forward end a firing pin 28. Initially, the arming plunger 27 is held against longitudinal movement within the body 11 by a shear pin 29 and projects into the sealing cup recess forward of the diaphragm 19 and adapted to be engaged thereby. Locking of the firing pin sleeve in the advanced position shown in Figs. 1, 2 and 4 is effected by a key ball 30 which is set in the side wall of the body 11 and projects into the wall of the firing pin sleeve 24. The key ball 30 is retained in the locking position by the forward end of the arming plunger 27 which is enlarged as shown.

At the extreme forward end of the fuze assembly is a booster cup 31 for the booster pellet 32 which forms the terminus of the explosive train carried by the fuze. Between the booster cup 31 and the shoulder 33 in the body 11 forward of the initial position of the firing pin sleeve 24, are a shutter assembly 34 and a setback assembly 36. The shutter assembly includes a firing pin guide 37 in the form of a plate which engages the shoulder 33 and receives the firing pin 28 in the bore 38 thereof. The firing pin guide is locked against rotation by a detent pin 39 carried by the body portion 11 and protruding into a slot 40 in the guide, and is provided with a forwardly directed eccentrically positioned shutter hinge pin 40*a* about which the shutter block 41 is adapted to rotate. A spring 42 wound around the pin 40*a* urges the shutter block from an initial or unarmed position (as shown in Fig. 2) to an armed position (as shown in Fig. 3). A socket 43 so positioned in the shutter 41 that it will be aligned with the firing pin 28 when the block is in the unarmed position, is adapted to receive the firing pin and so to hold the shutter block 41 from turning to the armed position. Additionally, the shutter block contains a detonator assembly 44 which is adapted to move into alignment with the firing pin when the shutter moves to its armed position. Forward of the shutter block 41 is a partition member 46 having a central stem 47 which carries a lead-in cup 48 containing an explosion charge 49. Sleeves 50 and 51 surrounding the shutter assembly 34 and the setback assembly 36, respectively, are employed in the fuze assembly as spacers to assure the proper positioning of the several internal moving parts. Slidably mounted around the stem 47 of the partition member 46 is a doughnut shaped setback block 52 held normally in its forward position by a spring 53. The setback block carries a shutter locking pin 54 which is adapted to move rearwardly through the opening 56 in the partition 46 to engage a detent 57 backed by a spring 58 and contained in a socket 59 in the shutter block. A socket 60 in the partition member 46 is adapted to receive the detent 57 when the shutter has been urged into its armed position under the influence of shutter spring 42.

The firing pin 28 is held firmly within the firing pin sleeve by a shear pin 61 and the entire firing pin assembly is urged rearwardly of the shutter mechanism by a coiled spring 62 compressed between the rearward surface of the firing pin guide 37 and a shoulder 63 on the firing pin sleeve.

Operation of the fuze is as follows: the fuze is mounted in the base of a rocket body and forwardly of the rocket motor. Before firing, the component parts of the fuze are in the position shown in Figs. 1, 2 and 4. Upon firing the rocket, great gas pressure is built up in the chamber 20 collapsing the diaphragm 19 causing the plunger 27 to shear the wire 29 and move forward to release the key ball 30. This action permits the rearward movement of the firing pin sleeve 24 and the firing pin 28 as shown in Fig. 5. Such rearward movement is caused not only by the action of spring 62 but also by acceleration forces.

The acceleration forces also cause the setback block 52 to move rearwardly against the action of its spring 53, thereby causing setback pin 54 to move into the socket 59 of the shutter 41 and prevent movement of the latter to its armed position during acceleration of the rocket projectile even though the firing pin has been removed from the shutter as above-described. After the acceleration forces have decreased to the point that spring 53 becomes operative, the set back block is moved forwardly by the spring, withdrawing the setback pin 54 and allowing the shutter 41 to move to the armed position shown in Figs. 3 and 5. When the shutter block moves to an armed position, the detent 57 moves into the socket 60 in the partition 46 to prevent the shutter

from moving out of the armed position. Upon striking the target, the firing pin **28** moves forwardly to strike the detonator cup **44**, thereby initiating an explosion which will follow through the lead-in cup **49** and the booster **32** in the conventional manner.

Where only limited penetration of the detonator by the firing pin head is desired, as in the case of a delayed action detonator, the firing pin is provided with a shoulder **66** adapted to cooperate with a similar shoulder **67** on the detonator body, thereby permitting penetration of the firing pin head only to the limited extent permitted by the dimensions of such detonator head. The shear wire **61** is designed to yield when the firing pin is thus arrested in its motion by the detonator body.

I claim:

1. In a rocket projectile, a fuze comprising a body contrived for mounting at the leading end of a rocket motor, a partition and a guide mounted in the body with a space therebetween, a booster detonator carried by the partition and a firing pin slidably carried by the guide, said firing pin being spring-loaded for movement away from the detonator, a spring-loaded shutter positioned in the space to separate the firing pin from the detonator, said shutter being hinged to the guide for swinging away from the separating position but being engaged by the firing pin to initially prevent swinging and thus assume an unarmed position, means actuated by gas pressure from the rocket motor to enable the firing pin to yield to its spring loading thereby to release the shutter in readiness for spring movement to an armed position, and spring-loaded acceleration-responsive means initially stood off from the partition by its spring loading but moving toward the partition counter to the spring loading by acceleration of the rocket projectile, said last means including a locking pin extending through the partition to intercept the shutter to defer its movement for a limited time to the armed position.

2. In a rocket projectile, a fuze comprising a body contrived for mounting at the leading end of a rocket motor, a partition and a guide mounted in the body with a space therebetween, said partition having a stem extending toward the leading end and away from the space, a booster detonator inserted in the stem and having one end exposed to the space, a firing pin slidably carried by the guide, said firing pin being spring-loaded for movement away from said exposed end, a spring-loaded shutter positioned in the space, initially covering the exposed end to separate the firing pin from the detonator, said shutter being hinged to the guide for swinging away from the separating position but being engaged by the firing pin to initially prevent swinging and thus assume an unarmed position, means actuated by gas pressure from the rocket motor to enable the firing pin to yield to its spring loading thereby to release the shutter in readiness for spring movement to an armed position, and spring-loaded acceleration-responsive means slidable on the stem and having a locking pin guided by the partition and projectible into the space, said last means being initially stood off from the partition by its spring loading to hold the locking pin retracted but moving counter to the spring loading by acceleration of the rocket projectile to project the locking pin into the space and intercept the shutter against turning for a limited time to its armed position.

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