Sept. 10, 1963 F. C. HUTCHISON ETAL 3,103,172

FUZE

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Fig. 1.

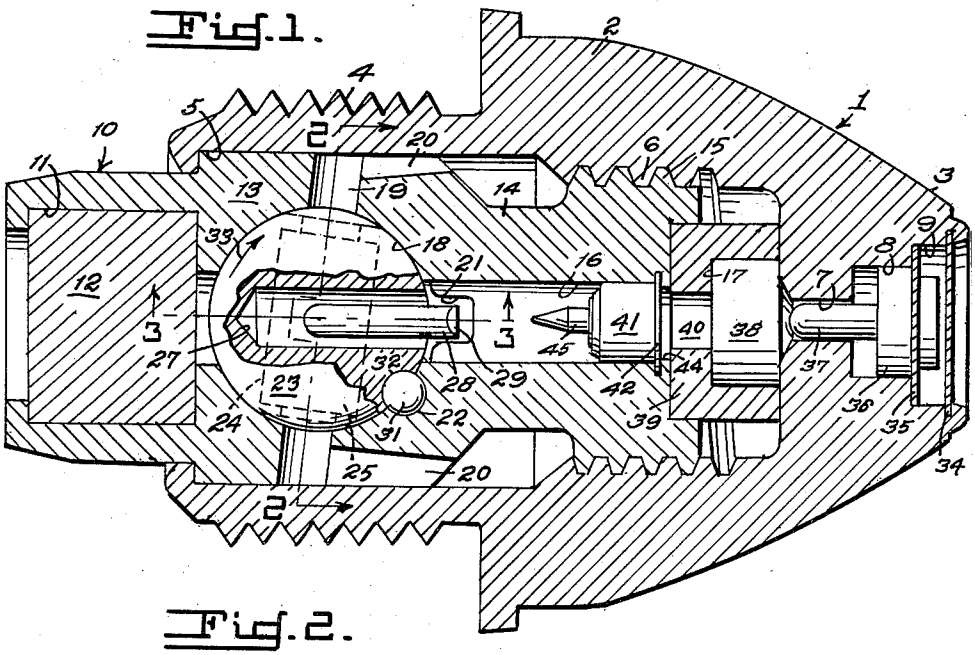


Fig. 2.

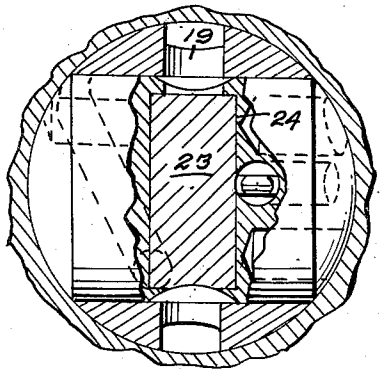


Fig. 3.

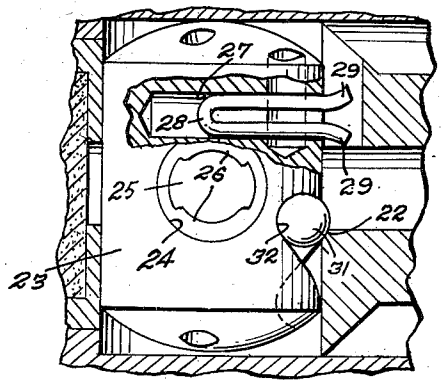
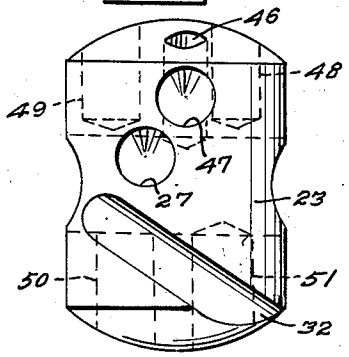


Fig. 4.



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FUZE

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1 Claim. (Cl. 102—75)

This invention relates to a fuze, and more particularly to a fuze having a delayed arming mechanism.

The present invention has for a primary object a delay mechanism to permit a high explosive charge to detonate after a shell has penetrated a target, such as an aircraft, for some distance whereby greater damage will be done.

Another object of the invention is a delay mechanism for a fuze that provides a primary firing element actuated by the crushing of a projectile nose to fire a primer whereby pressure is built up behind a secondary firing pin to cause a second detonator in a cylindrical rotor to be detonated and fire the booster charge, thereby constituting a delay train in a fuze.

It is a further object to provide a fuze which is extremely simple in operation and highly efficient in its action.

The specific nature of the invention as well as other objects and advantages thereof, will clearly appear from a description of a preferred embodiment as shown in the accompanying drawings, in which:

FIG. 1 is an axial section taken through a fuze constructed in accordance with the invention;

FIG. 2 is a sectional view taken along lines 2—2 of FIG. 1 and looking in the direction of the arrows;

FIG. 3 is a sectional view taken along lines 3—3 of FIG. 1 and looking in the direction of the arrows, the rotor and ball being shown in elevation and the rotor being broken away to reveal the lock spring; and

FIG. 4 is an elevational view of the rotor as viewed from the front.

Referring to the drawings, 1 denotes a fuze generally and comprises an outer body 2 defining an ogival nose portion 3 and an externally threaded rearward portion 4 for attachment to a projectile, not shown.

Outer body 2 is centrally bored as at 5 to receive fuze operating elements as to be later described. Bore 5 is internally threaded as at 6, and counterbored as at 7, 8 and 9 for a purpose to be apparent later.

An inner body generally indicated by 10 is adapted to be received in bore 5.

Inner body 10 is generally cylindrical in shape and includes an axial bore 11 in its rearward portion to receive a booster charge 12.

Inner body 10 further defines a cylindrical middle portion 13 adapted to fit bore 5 of outer body 2 and is provided with a reduced portion 14 forwardly of portion 13 and an externally threaded portion 15 adapted to engage threaded portion 6 of outer body 2.

Inner body 10 is axially bored as at 16 and counterbored as at 17 and the middle portion 13 is provided with a cylindrical bore 18. Middle portion 13 is further bored radially as at 19 and is provided with ports 20 which communicate between bores 19 and space 21 formed by reduced portion 14 of inner body 10. Slots 21 and 22 are provided for purposes as will be later apparent.

Arming means for the fuze is provided and consists of a cylindrical rotor indicated generally by 23 which is rotatably mounted in cylindrical bore 18. Rotor 23 is transversely bored as at 24 to receive a detonator 25. Bore 24 is crimped at one end with half-moon crimps 26, best seen in FIG. 3 to prevent dislodgement of detonator 25 from the rotor 23.

Means for preventing rotor 23 from rotating to an

armed position is provided and comprises a bore 27 in rotor 23 having its axis at 90° to the axis of bore 24 and receiving a lock spring 28 which is provided with ears 29 (see FIG. 3) adapted to fit in slot 21 in inner body 10.

Means for preventing rotor 23 from rotating beyond its armed position in the fuze, wherein bore 24 is aligned with bore 16, is provided by a ball 31 traveling in a helical groove 32 in the outer surface of cylindrical rotor 23 and in a straight slot 22 in the inner body 10 extending the width thereof.

Firing mechanism for the fuze is provided and consists of a closing disc 34 which closes bores 7, 8, and 9 in nose 3. A primary firing pin 36 provided with a flange 35 and a point 37 is slidable in bore 8 and is held against rearward movement by a flange 35 which bears against a shoulder formed by bores 8 and 9. Rearwardly in bore 17, there is fixed a primer 38 carried by a holder 39. A primary firing pin 41 having a point 45 is slidable in bore 16 and has a shear washer 42 integral therewith slidable in a smaller bore 44 coaxial between bores 16 and groove 32 and is prevented from rearward movement by a shoulder formed by bores 16 and 44.

Operation of the arming mechanism.—When the projectile, not shown, including the attached fuze of the invention, is fired from a gun, also not shown, the acceleration force acts to close ears 29 on lock pin spring 28 sufficiently to completely enter bore 27 thereby freeing rotor 23 for rotation in a clockwise direction 33. Its rotation will be stopped when detonator bore 24 is in axial alignment with bore 16, whereby the fuze will be armed. This is accomplished by ball 31 traveling in helical groove 32 and down in straight slot 22 until it touches bore surface 5 of outer body 2.

Operation of the firing mechanism.—The fuze is initiated by impact of the nose portion 3 with a target. Crushing of the nose portion 3 together with closing disc 34 will cause flange 35 of the primary firing pin 36 to shear and advance point 37 to penetrate primer 38 in holder 39. The orifice 40 delays the build up of gas pressure behind secondary firing pin 41. When sufficient pressure is built up, shear washer 42 will be severed and the firing pin 41 will be propelled down bore 16 in inner body 10 and point 45 will penetrate detonator 25 to fire booster charge 12 and the main charge of the projectile, not shown.

The time consumed in this process allows the shell to penetrate the target to some distance before the main charge, not shown, is detonated. This results in greater damage being done behind the target as would be desirable such as in ammunition used against aircraft.

The configuration of the rotor 23 is such that it affects the static and dynamic balance thereof. Bores 24, the half moon crimps 26, helical groove 32 and bores 46, 47, 48, 49, 50, and 51 all contribute to imparting the static balance and minimize the effect of off center rotation and also control the speed of rotation.

While the round is in a gun, rotor 23 cannot rotate until after set back.

It is apparent from the foregoing, that an improved delay mechanism has been devised for use in a fuze that is highly simple of construction and effective in action.

While a preferred form of the invention has been shown and described, various modifications and substitutions of equivalents will occur to those skilled in the art after a study of the foregoing disclosure. Hence, the disclosure should be taken in an illustrative rather than a limiting sense.

What is claimed is:

In a fuze, an outer body having a nose portion, an inner body having an axial bore and a transverse bore normal to said axial bore, there being a first semi-circular,

straight, longitudinal groove in its inner peripheral surface thereof, a cylindrical rotor mounted in said transverse bore, a first detonator mounted in said rotor, said rotor having a second semicircular helical groove in its outer circumferential surface and disposed in opposed relation to said first semicircular groove, a detent ball seated for travel between said first and second semi-circular grooves, said ball adapted to limit the travel of said rotor between an unarmed to an armed position, means for preventing said rotor from rotating into said armed position, said means comprising a bore in said rotor, there being a slot in said inner body adjacent said transverse bore, a lock spring having outwardly curved ears, said spring normally housed in said bore in said rotor and said ears normally received in said slot when said rotor is in its unarmed position, said lock spring to completely enter said bore in said rotor upon acceleration force to unlock said rotor for rotation towards its armed position, a firing means for said fuze comprising, a first axially aligned firing pin mounted in said nose portion, a second axially aligned detonator fixed in the forward portion of said inner body rearwardly of said first firing pin and a second axially aligned firing pin mounted in said axial bore in said inner body, said first firing pin being moved rearward to fire said second detonator upon target impact of said nose whereby gas pressure from said second detonator will impinge upon said second firing pin to move said second firing rearwardly to fire said first detonator.

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