

- [54] COLLAPSING CAPSULE FUZE
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- [73] Assignee: The United States of America as represented by the Secretary of the Army, Washington, D.C.
- [22] Filed: Apr. 9, 1973
- [21] Appl. No.: 349,526

3,646,889 3/1972 Davis 102/7.2

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 Attorney, Agent, or Firm—Edward J. Kelly; Herbert Berl; Thomas R. Webb

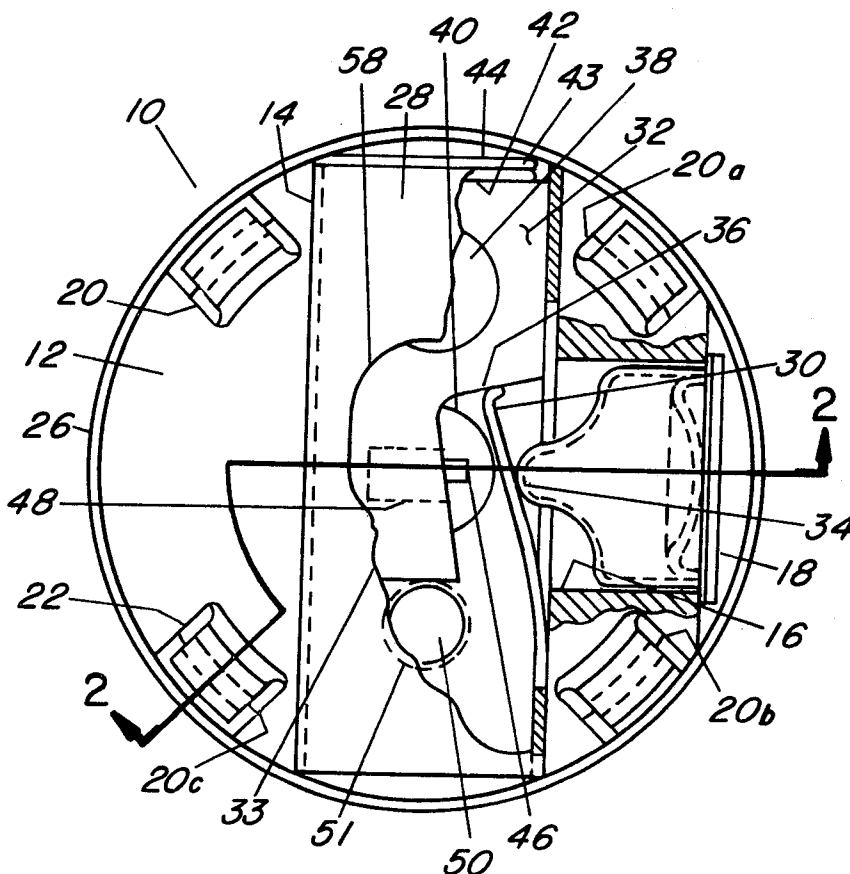
- [52] U.S. Cl. 102/76 P, 102/7.2, 102/81
- [51] Int. Cl. F42c 15/12
- [58] Field of Search 102/76 R, 81, 70, 72, 76 P

[57] **ABSTRACT**
 A collapsing capsule fuze provides a dual-environmental out-of-line safety slider-dettonator assembly. The fuze is designed to hold the detonator out-of-line with respect to a firing pin with or without spin and/or setback. The detonator is held in an out-of-line "safe" position by a capsule and detent features. The slider is released when the munition is a significant distance from the launch crew and the fuze is subjected to gas pressure which collapses the capsule allowing the spring biased detent to move away from the slider and the detonator to move into an "armed" position.

- [56] **References Cited**
 UNITED STATES PATENTS

2,513,185	6/1950	Lauritsen	102/81
3,583,321	6/1971	Anderson et al.	102/81
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5 Claims, 4 Drawing Figures



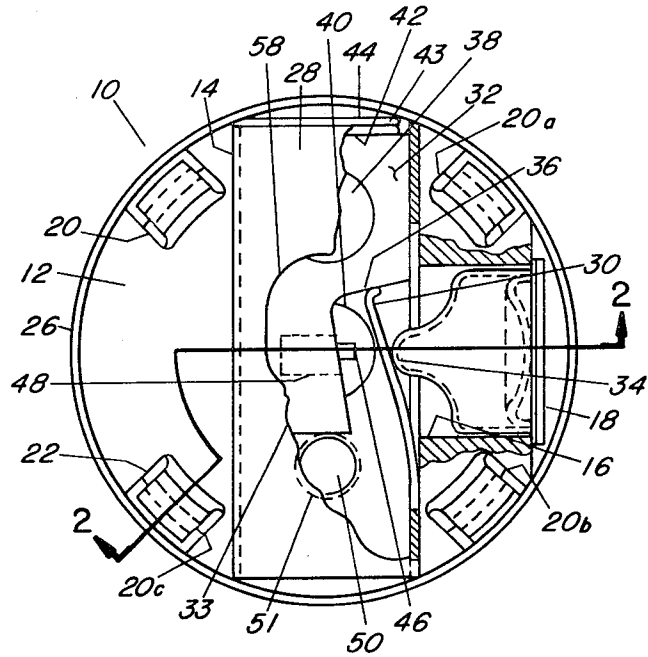


FIG. 1

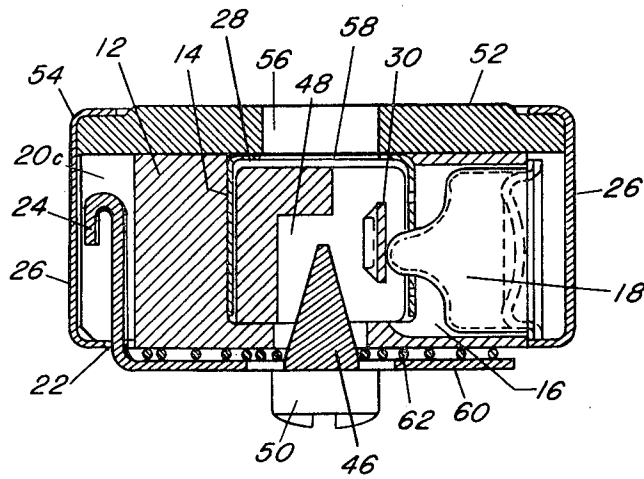


FIG. 2

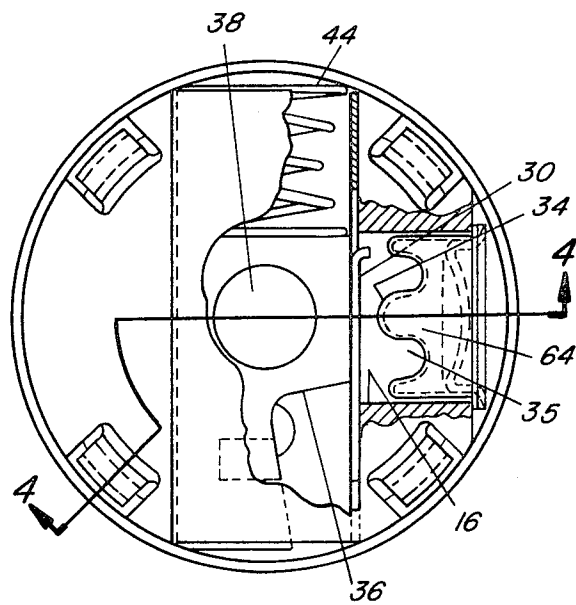


FIG. 3

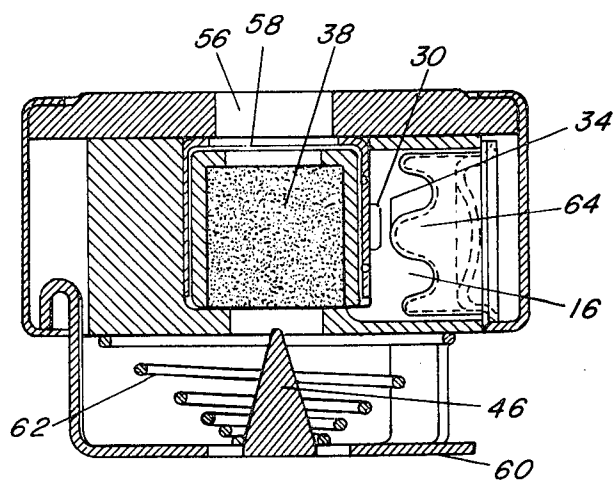


FIG. 4

COLLAPSING CAPSULE FUZE

GOVERNMENTAL INTEREST

The invention described herein may be manufactured, used and licensed by or for the Government for governmental purposes without the payment to me of any royalty thereon.

BACKGROUND OF THE INVENTION

Various means have been used in the prior art to maintain a sub-munition in a safe condition during assembly, transportation, storage and initial launch and flight of its carrier. The prior art devices depended primarily upon "launch environments" such as linear and angular accelerations, or combinations thereof such as for example setback and spin operated mechanical or electrical inertia responsive bore riders or lever mechanisms. The problem with these prior art devices was that the safing feature was released during or shortly after the launch event and in event of a mal-function the launch crew and/or friendly troops were endangered.

The present invention provides a means for arming a munition when it is a maximum safe distance away from the launching vehicle and precludes the use of prior art means for safing which are dependent upon launch environmental forces. The present invention is particularly applicable for launch or drop modes in which the magnitude of the acceleration environments is too low to activate a safe-and-arm release mechanism.

SUMMARY OF THE INVENTION

The present invention relates to a collapsing capsule arming device for a sub-munition. A detonator is held in an out-of-line position in a spring biased slider-detonator assembly, during manufacture, firstly by a spring detent tab, located in a slider detent groove, which is fixedly held in the slider groove by a protrusion on a collapsing capsule, and secondly by a firing pin which fits into a slider firing pin groove. The firing pin is kept within the slider firing pin groove during assembly of the sub-munition into the munition by a safety screw, which fixedly holds a spring biased striker plate, to which the firing pin is integrally affixed, firmly attached to the sub-munition housing. The safety screw is not removed until such time as the munition is packaged in a container. The striker plate is held in its depressed position by confinement within the package. Immediately prior to use the container is pressurized which causes the collapse of the capsule and thereby releases the detent. The slider-detonator assembly now only held by the depressed firing pin is released therefrom when the striker plate is separated from the housing by the striker plate spring. The withdrawal of the firing pin from the slider firing pin groove permits the slider to move to its "armed" position under the force of the compressed slider spring. Upon impact the firing pin is driven into the in-line detonator causing the munition to explode.

One of the objects of the present invention is to provide a collapsing capsule arming device which has a positive safety release mechanism which is independent of the munitions launch environment.

Another object of the present invention is to provide a collapsing capsule arming device which insures the

maximum possible safe-separation distance between the launch crew and the armed munition.

Another object of the present invention is to provide a small munition fuze which provides dual-environmental out-of-line safety during assembly, handling, transportation, storage, and packaging of a munition in a container.

Another object of the present invention is to provide a fuze which can safely and reliably arm a munition with or without spin and/or setback.

A further object of the present invention is to provide a munition fuze which because of its simplicity of design is cheap to make and amenable to mass production by known, state-of-the-art fabrication methods.

For a better understanding of the present invention, together with other and further objects thereof, reference is made to the following descriptions taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cutaway, partial cross-sectional, plan view of the invention, prior to the insertion of the fuze baffle disc and the closure of the housing over the fuze baffle disc, showing the fuze in its "safe" unarmed position.

FIG. 2 is a cross-sectional view taken along line 2—2 of FIG. 1, with the fuze baffle disc staked therein.

FIG. 3 is a cutaway, partial cross-sectional, plan view of the invention, with the fuze baffle disc removed, showing the fuze, after pressurization and release from the carrier, in its "armed" position.

FIG. 4 is a cross-sectional view taken along line 4—4 of FIG. 3 showing the fuze in its "armed" position after pressurization and release from its munition carrier immediately prior to impact upon a target.

Throughout the following description like reference numerals are used to denote like parts of the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1 and 2 the collapsing capsule arming device or fuze 10 has a disc shaped fuze body 12 which has a radially extending "U" shape slider body groove 14 therein. Communicating with the slider body groove 14 and at right angles thereto is a capsule body bore 16 which holds therein a pressure collapsible capsule 18. Body 12 has four longitudinal peripherally radially positioned striker plate body guide grooves 20, 20a, 20b and 20c therein. Housing bottom section lip 22 permits the striker plate guide wall 24 and the guide walls 24a, 24b and 24c (not shown) to slidably pass through the bottom section of housing cylinder 26. A "U" shaped slider retainer 28 has an integral spring detent tab 30 therein. Detent tab 30, first of three of detent means, is inwardly biased toward the slider 32 by the capsule protrusion 34 so that the former falls into a slider detent groove 36 thereby fixedly holding a detonator 38, operatively positioned in slider 32, out-of-line with the centrally positioned firing pin body bore 40 when the fuze 10 is in a "safe" position. When the rectangularly "L" shaped slider 32 is fixedly held in the "safe" position, the slider rear end 42 biasedly holds slider spring 44 in compression. A triangularly shaped firing pin 46, which is the second of the three detent means and is punched out of striker plate 60, protrudes into slider slot 48 through the firing pin

body bore 40 thereby preventing the rectangularly "L" shaped slider 32, along with the spring detent tab 30, from moving into an "armed" position. In addition to the two aforementioned detent restraints on the slider 32 during assembly, a safety screw 50, fixedly held in safety screw thread body bore 51, acts as a stop in front end 33 of the slider 32. FIG. 1 shows a top view of the fuze 10 prior to the completion of fuze assembly. FIG. 2, a cross section of the complete assembly, shows the disc fuze baffle plate 52 in its operative position held adjacent to fuze body 12 by the peened over housing edge 54. A fuze baffle plate bore 56 is aligned with a retainer bore 58 and in-line with the detonator 38 when the fuze is in an "armed" position as shown in FIGS. 3 and 4. The safety screw 50 in addition to preventing motion of the slider-detonator assembly 32 also holds striker plate 60 against the intermediately positioned, compressed, striker plate spring 62 so that the firing pin 46 cannot be withdrawn from the slider slot 48.

Referring now to FIGS. 3 and 4, the fuze 10 is shown in an "armed" position after the safety screw 50 has been removed, the container carrying the munition has been pressurized, and the munition has been deployed over its intended target. The collapsed capsule 64 has had its protrusion 34 pushed by gas pressure into the capsule body bore 16 so that the capsule front end 35 is recessed. The spring detent tab 30 no longer restrained by capsule protrusion 34 has moved out of the detent groove 36 thereby removing the last restraint on the slider 32 from being pushed by slider spring 44 into the "armed" position (FIG. 4), thus aligning the detonator 38 so that it is in-line with the firing pin 46, fuze baffle plate bore 56, and the retainer bore 58.

In operation, when the munition is packaged in its container, the safety screw 50 is removed and the striker plate 60 is held in its "safe" depressed position by confinement within the package. Also at this time the fuze slider 32 is held in its unarmed "safe" position by engagement of the integral firing pin 46 in the slider slot 48 and by the capsule protrusion 34 pushing against detent tab 30. Immediately prior to use, the interior of the container (not shown) is pressurized to collapse the capsule 64, thus releasing the detent tab 30 as shown in FIGS. 3 and 4. This action leaves the fuze slider 32 held, in the unarmed "safe" position, only by the depressed firing pin 46. After the munition is released from the container, the striker plate 60 is forced by the slider spring 44 to the "armed" position shown in FIG. 4, thus withdrawing the firing pin 46 from the slider slot 48. The slider 32 then is moved by striker plate spring 62 to the end of its travel, at which point the detonator 38 is aligned with the firing pin 46 and the fuze baffle plate bore 56. Upon impact, the striker plate 60 drives its integral firing pin 46 into detonator 38 which functions through retainer bore 58 and baffle plate bore 56, thereby initiating the main charge of the munition and thus completing the mission.

The foregoing disclosure and drawings are merely illustrative of the principles of this invention and are not to be interpreted in a limiting sense. I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

Having thus fully described this invention, what is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A fuze for safing a munition during assembly, packaging, transportation and storage, and for arming said munition after launch and release from a carrier when said munition is a safe distance away from a launch crew, and for exploding said munition on impact upon a target which comprises:

a housing for holding said fuze;
a disc shaped fuze body operatively and fixedly held in said housing;

a disc shaped fuze baffle plate fixedly held by said housing intermediate said housing and the top of said fuze body, said baffle plate having a central baffle plate bore therein;

biased slider means slidably positioned in said fuze body;

a plurality of detent means for holding said biased slider means in an out-of-line position in said fuze body when said fuze is in a "safe" condition;

collapsible capsule means fixedly positioned in said fuze body adjacent a first of said detent means for permitting the release of said detent means and arming said fuze after said munition has been released from said carrier and said munition is in proximity of said target; and

a spring biased striker plate means slidably held intermediate said housing and said fuze body for initiating said fuze when said munition impacts upon said target.

2. A fuze as recited in claim 1 wherein said fuze body includes a plurality of longitudinal peripherally spaced striker guide grooves, a "U" shaped slider body groove radially positioned in said disc shaped fuze body upper surface, a centrally positioned firing pin body bore communicating with said "U" shaped slider body groove, a safety screw threaded body bore for threadedly holding therein a second of said detent means, and a radially transversely positioned capsule body bore communicating with said "U" shaped slider body groove for holding therein said collapsible capsule means.

3. A fuze as recited in claim 2 wherein said striker plate means include a firing pin, and said biased slider means comprises:

an "L" shaped slider operatively positioned in said "U" shaped slider body groove having a rear end and a front end, a slider detent groove intermediate said rear end and said front end, and a slider slot axially positioned over said firing pin body bore when said slider is in a "safe" position;

a slider spring intermediate said housing and said slider rear end holding said slider spring in compression, wherein said slider spring urges said slider into an in-line, "armed" position when said plurality of detent means are removed; and

a detonator fixedly held in said slider and operatively positioned therein so that when said slider is in said "armed" position said detonator is directly over and axially aligned with said firing pin, and when said slider is in said "safe" position said detonator is out-of-line with said firing pin.

4. A fuze as recited in claim 3 wherein said plurality of detent means comprises:

a "U" shaped slider retainer fixedly positioned in said "U" shaped slider body groove intermediate said fuze body and said slider, intermediate said baffle plate and said slider having an integral spring detent tab operatively positioned adjacent said slider

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detent groove, and a retainer bore whose opening communicates with said firing pin body bore and said central baffle plate bore;
 a safety screw threadedly held in said safety screw threaded body bore when said fuze is in said "safe" position for restraining said slider front end from moving; and
 a striker plate being held adjacent said fuze body by said safety screw when said fuze is in a "safe" condition so that said firing pin protrudes through said firing pin body bore into said slider slot thereby preventing said slider from moving, and when in

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said "armed" condition said striker plate is biasedly positioned by said slider spring so that said firing pin is withdrawn from said slider slot.

5. A fuze as recited in claim 4 wherein said collapsible capsule means comprises:
 a cylindrical capsule having a protrusion on its front end; and
 said fuze further includes, pneumatic means for collapsing said capsule front end, thereby moving said protrusion away from said spring detent tab.

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