Feb. 7, 1967 C. W. LINDBERG ET AL 3,302,572

DELAYED FUZE MECHANISM

Filed June 3, 1965

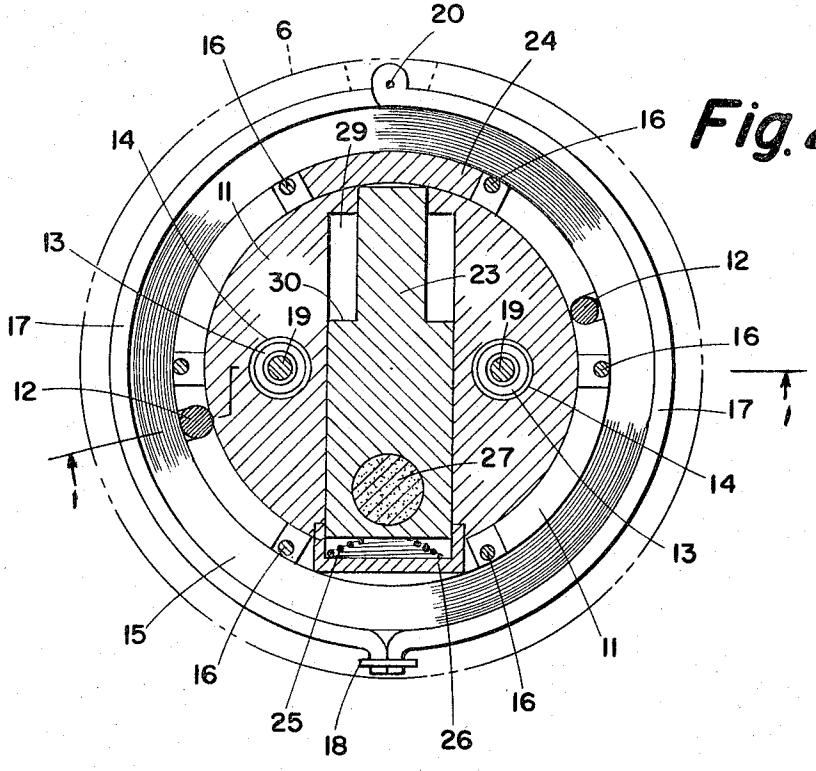
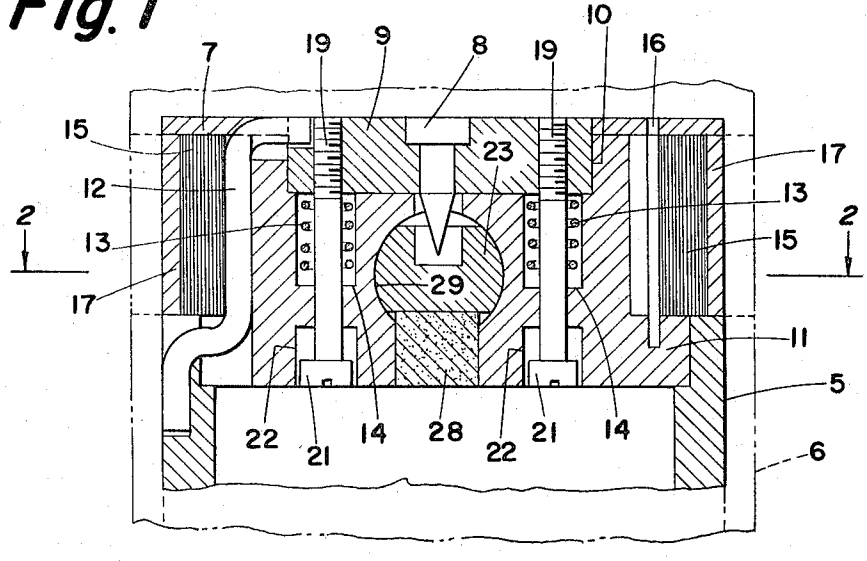


Fig. 2

Fig. 1



INVENTORS.
CHARLES W. LINDBERG
ELVIN W. TLAM
BY ROBERT L. BONDE
Harry M. Saragovitz,
Edward J. Kelly, Herbert Berl
& S. Dubroff
ATTORNEYS

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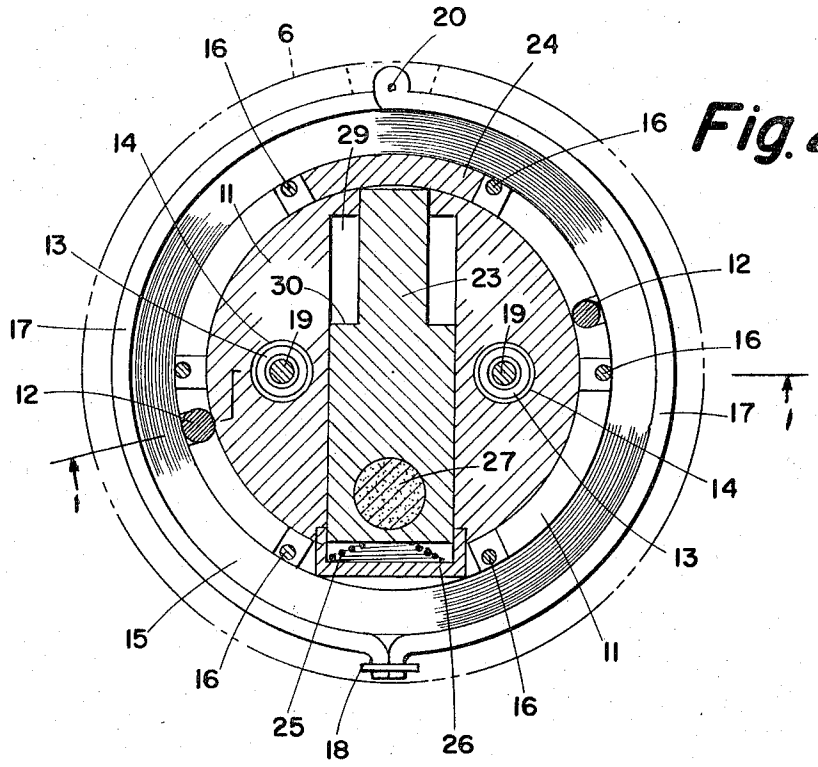
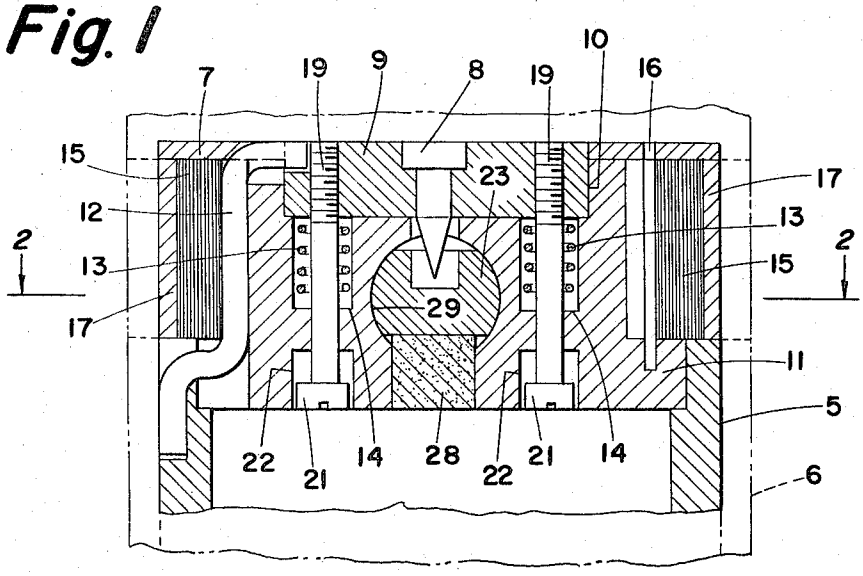


Fig. 2

Fig. 1



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& S. Dubroff
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United States Patent Office

3,302,572

Patented Feb. 7, 1967

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DELAYED FUZE MECHANISM

Charles W. Lindberg, Hopkins, Elvin W. Tlam, Excelsior, and Robert L. Bonde, Minneapolis, Minn., assignors, by mesne assignments, to the United States of America as represented by the Secretary of the Army

Filed June 3, 1965, Ser. No. 461,214
4 Claims. (Cl. 102—79)

The present invention relates to delayed fuze mechanisms for flight vehicles such as projectiles which carry an explosive charge for detonation on impact. In such space vehicles the arming of the firing mechanism or fuze is delayed until the vehicle is in flight sufficiently far to be safe against accidental firing.

It is an object of this invention to provide an improved delayed fuze mechanism of this type which is relatively simple in construction and effective to provide additional control of the flight vehicle.

It is a further object of this invention to provide an improved delayed fuze mechanism for use in projectiles and to provide arming mechanism release after a predetermined time delay in flight by a plurality of tracking flexible fabric streamer or ribbon elements packaged to slowly unwrap to obtain a time delay function and at the same time a known control type of orientation in flight of the projectile by the effectively trailing load or drag.

In accordance with the invention, a fuze mechanism has a spring-biased slide to carry a detonator or other operating element into an armed or operative position in the mechanism. Time delay in the setting of the detonator or operating device is provided by a plurality of cloth or like streamers which are flexible and ribbon-like and wound around a peripheral area of the fuze mechanism to maintain the slide or like device locked in place until completely unwound after release into the air stream. The amount of delay depends upon the number of ribbon elements, their length and the rotational velocity of the projectile and fuze in flight. The invention will, however, further be understood from the following description when considered in connection with the accompanying drawings, and its scope as pointed out in the appended claims.

In the drawings, FIG. 1 is a cross-sectional view, in elevation, of a fuze mechanism for a projectile in accordance with the invention, and

FIG. 2 is a cross-sectional plan view of the fuze of FIG. 1 taken on the section line 2—2 thereof, and showing further details of construction in accordance with the invention. In this figure the section line 1—1 indicates the line of cross-section of the fuze on which FIG. 1 is taken basically.

Referring to the drawings, in which like reference numerals designate like parts in both figures thereof, the fuze mechanism comprises an outer cylindrical casing **5** which is adapted to be mounted in a corresponding cylindrical casing of a projectile as indicated at **6**, for firing the usual load or explosive charge therein. The casing is provided with a flat ring-like enclosure or top element **7** through which a central firing pin **8** and a surrounding round inertial block **9** operate upon activation of the fuze mechanism. The block and firing pin move axially in a central open guide well **10** in continuation of the opening in the cover plate **7**, and formed in a flanged inner cylindrical base element **11** for the fuze. This is seated in the shouldered open end of the casing **5** in fixed relation thereto as indicated.

The fuze mechanism is basically an impact operated device which includes the central firing pin **8** solidly mounted in the cylindrical axially-movable inertial block **9**. The latter is, in turn, movable in the open end of the shouldered well **10** in the base from which it moved upwardly, as viewed in FIG. 1, to the cover plate **7** from the seated position shown. A pair of release arms **12** hold the block **9** in this position to thereby compress two coiled springs **13**. These are seated in counter-bored sockets in the fuze base **11** and act against the inertial block **9** to move it upwardly as viewed in FIG. 1. The block carries two parallel-spaced guide pins **19** screwed into it as indicated in FIG. 1 and extending through the sockets **14** and into stop wells **22** for enlarged screw heads **21** on the lower ends of the pins **19** also as indicated in FIG. 1. The wells **22** are of suitable depth to permit upward movement of the inertial block **9** sufficient to bring the firing pin **8** out of engagement with a cross-bolt or slide **23** in which it is normally seated in the "safe" position shown in FIG. 1.

The release arms **12** lock into the inertial block **9** and hold it in the retracted position shown and are located in recesses in the outer wall of the base element **11**. In this position the release arms **12** hold the block **9** in the position shown to thereby compress the springs **13**.

Coiled around the circumference of the fuze, one over the other in a plurality of layers, are a plurality of cloth ribbons or like flexible thin fabric streamer elements **15**. As disclosed in FIG. 2 this device uses 6 ribbons, each being attached to a separate anchor pin as indicated at **16**. Surrounding the ribbons **15** is a releasable locking means, such as a double-hinged cover **17** which holds the ribbons in place as shown in both figures. When this device is propelled toward an objective, a safety mechanism **18**, comprising in the present example, a simple destructible link responsive to the centrifugal force exerted on the cover portions as they tend to pivot about the axis **20** and separate at the outer sides at the pair of edges which are held by the link. When a predetermined rotational speed is reached, indicating free flight in space, the link severs and the covers fly out under the centrifugal force of rotation, and release the ribbons.

After the cover **17** has separated from the fuze and is free of the device, the ribbons **15** then are free to unwind and trail behind the device in flight to provide orientation thereof toward the desired objective as flight continues. The release of the ribbons also allows the arms **12**, that is, the latch members for the inertial block **9**, to fly outwardly under centrifugal force and release the block and firing pin which are then driven upwardly to the armed position by the springs **13**, as limited by the stop screw heads **21** in the guide wells **22**.

The firing pin is thus removed from the slide or bolt **23**, which is normally held in the position shown in FIG. 1 by a slide or bolt lock plate **24** that also is allowed to fall free when the ribbons unwind. The slide or bolt **23** is then driven to the armed position, which is upwardly as viewed in FIG. 2, by a slide or bolt spring **25** when the lock-plate **24** is removed. A cup-shaped socket **26** is provided for the bolt spring **25** as a seat for the fixed end thereof in the base **11**, and under its action the bolt **23** moves in a transverse circular guide bore **29** in the base **11** until its forward end of reduced diameter projects fully from the base and brings a stop shoulder **30** to a seat against the inner end of the bore in a pre-determined position.

In this position, a detonator **27** is brought directly under and in alignment with the withdrawn firing pin **8**. The detonator is carried, within the slide or bolt **23**, into the position referred to which is between the firing pin **8** and a lead cup **28**. Upon impact with the ground or an objective, the inertial block **11** is forced in the direction of flight or downwardly, in the present example, against the springs **13** to thereby drive the firing pin **8** into the detonator **27**.

By this means of improved and simplified construction, a time delay function is obtained in the operation of

the fuze while at the same time the moving body is oriented in flight by the use of the releasable streamers. It is noted that after the cover **17** is released, the ribbons **15** slowly unwind over an extended period of time (due to the winding effect of the air if the device is rotating). The slide or bolt lock **24** is maintained firmly in place until the ribbons completely unwind, thereby preventing the slide or bolt **23** from placing the detonator **27** in the armed position. The amount of time delay thus achieved depends upon the number of ribbons used, their length, and the rotational velocity of the projectile and fuze during flight.

It should be noted that the ribbons may be wound opposite to the direction of rotation if a longer delay is desired. The aerodynamic forces then act to keep the ribbons wound and delay the arming until the rotary forces have largely been dissipated. While six cloth ribbons have been used in the present example, a greater or lesser number may be used in accordance with the desired timing as above indicated. It is normal to provide a considerable length of unwind whereby a considerable length of streamer effect in the flight of the projectile is provided for effective orientation and guidance of the device toward the objective.

From the foregoing description it will be seen that a simplified delayed fuze mechanism is provided by the locked inertial block and the locked slide or bolt under respective control of the release arms **12** and the bolt lock **24**, both locked by the positive delay mechanism provided by the plurality of wound ribbons, in turn locked in place by the detachable cover means and initial safety device **18** which locks the cover plate in place. In this way, the projectile must be in motion at a predetermined spin rate before the initial release of the cover plates or cover and the beginning of the slow unwind or unwrap of the plurality of ribbons as flight continues. Therefore the fuze is delayed in its arming operation well into the flight range whereby it is safe beyond any question in use, and yet the same simple and effective means also tends to orient the projectile towards its objective.

We claim:

1. A delayed fuze mechanism for projectiles in flight and subjected to spin operation above a pre-determined speed, comprising in combination,

a fuze base having a cylindrical peripheral surface,
a central axially-movable inertial block therein,
a firing pin carried by said block and movable axially therewith from an unarmed position to an armed position,
a pair of release arms in the periphery of the base engaging the inertial block for locking said block and firing pin in the unarmed position,
a transversely-movable bolt in said base,
a bolt-locking element lying in said peripheral surface of the fuze base for holding the bolt in a normal retracted position,
a detonator element carried by said bolt and movable therewith to an armed position in alignment with the firing pin in its armed position upon release of said bolt locking element,
a plurality of flexible ribbon elements wrapped in layers about the periphery of said base to lock and hold said release arms and bolt locking element in place,
releasable cover means for said ribbon elements surrounding and engaging the outer layer thereof to hold said ribbon elements in place during initial flight and rotation of a carrier projectile and,
means responsive to a predetermined speed of rotation of said fuze for releasing said cover means and said ribbon elements to introduce a time delay in unwinding and releasing said firing pin and bolt to the armed position well into the flight range.

2. A delayed fuze mechanism as defined in claim **1**, wherein the inertial block is provided with a pair of spaced guidance and stop pins movable therewith in the base and a pair of coiled springs one surrounding each of said stop pins and in operative engagement with the inertial block, and wherein the transversely movable bolt is carried by and guided in a tranverse circular guidance bore in the base and is spring-actuated into the active position upon reelase of the cover plate.

3. A delayed fuze mechanism for projectiles subject to rotational movement in flight, comprising in combination,

a fuze base for mounting in a projectile,
a central inertial block coaxially movable in said base,
a firing pin carried by said block and movable axially therewith from an unarmed position to an armed position,
spring basing means connected between said base and inertial block for resiliently moving said block and firing pin to said armed position,
an outer releasable latch element engaging the base element and inertial block for holding said block and firing pin in the unarmed position,
a transversely movable bolt in said base,
an outer releasable bolt stop for holding the bolt in a normal retracted unarmed position along its axis,
a detonator element carried by said bolt and movable therewith to an armed position with respect to said firing pin,
a plurality of releasable flexible ribbon elements wrapped effectively in layers around and attached to the base to grip and hold said latch element and bolt stop in place,
means for retaining said ribbon elements in place during initial flight and rotation of said fuze in operation, and
means responsive to a pre-determined speed of rotation for releasing said last named retaining means and initiating a delayed arming of said fuze mechanism as the ribbon elements unwrap in flight and trail out from the base to stabilize the carrier projectile in its trajectory.

4. A delayed fuze mechanism for arming projectiles in flight, comprising in combination,

a cylindrical fuze base,
a cylindrical inertial block coaxially movable in said base,
a central firing pin carried by and extending axially from said block to move therewith from an unarmed to an armed position,
an outer releasable latch element holding said block and firing pin in the unarmed position,
an elongated transversely-movable bolt element in the base,
an outer releasable bolt stop holding the bolt element in a retracted unarmed position along its axis,
a detonator element carried by said bolt element for movement therewith in the transverse direction from the unarmed position to an armed position for impact contact with the firing pin,
a plurality of flexible ribbon elements connected each at one end with the base and wrapped in overlapping relation around the periphery of the base to bind and hold said releasable latch and bolt elements in place,
releasable retaining means for said ribbon elements,
means responsive to a pre-determined speed of rotation for releasing said last-named retaining means,
thereby to initiate a delayed arming action of said mechanism as the ribbon elements unwrap in flight and finally release said bolt element and firing pin to fire the detonator element on impact of a carrier projectile.

No references cited.

SAMUEL FEINBERG, *Primary Examiner.*
G. H. GLANZMAN, *Assistant Examiner.*