June 9, 1964 L. J. DE SABLA ETAL 3,136,252

FORCE DISCRIMINATING MECHANISM

Filed Aug. 7, 1962

FIG.1.

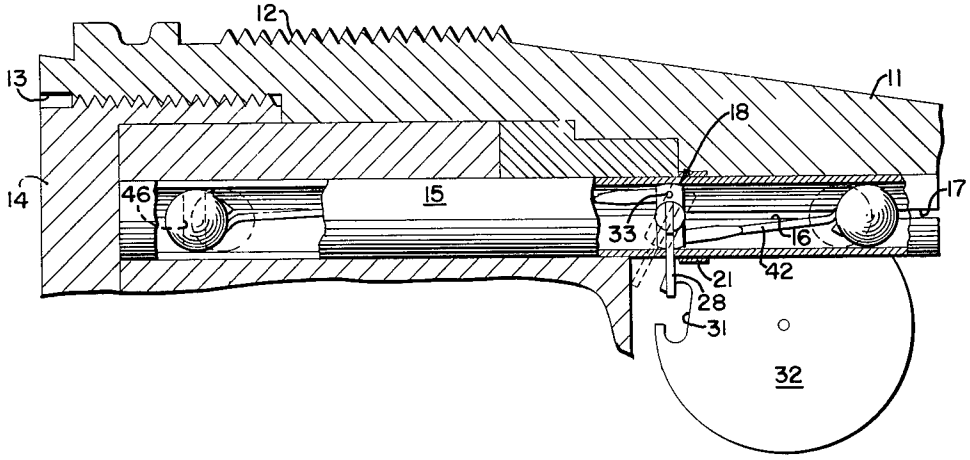


FIG.2.

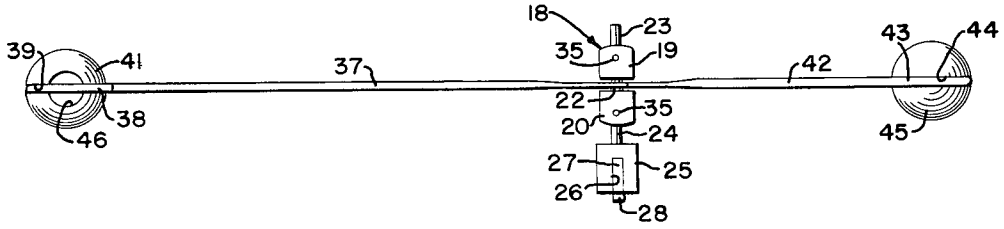
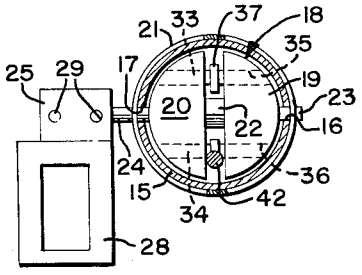


FIG.3.



INVENTORS
LOUIS J. de SABLA
WILLIAM J. DONAHUE

BY W. Hodges ATTY.

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FORCE DISCRIMINATING MECHANISM

Louis J. de Sabla, Silver Spring, and William J. Donahue, Takoma Park, Md., assignors to the United States of America as represented by the Secretary of the Navy

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The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

This invention relates to a safety mechanism for a projectile fuze and more particularly to a mechanism for effectively restraining the arming of a fuze when there is abnormal rotation of the projectile.

In the field of projectile fuze arming, it has been the general practice to employ various types of safety mechanisms of the inertial or centrifugal type to prevent premature initiation of the explosive charge in a projectile. None of these prior art mechanisms, however, has been capable of functioning in a force discriminating manner, that is, none of them has been constructed to prevent the arming of the detonating device or fuze in a projectile when it is subjected to abnormal or inadvertent rotation, while allowing the arming of the fuze when there is normal linear motion of the projectile.

The general purpose of this invention, therefore, is to provide a fuze safety mechanism which embraces all the advantages of similarly employed prior art mechanisms and possesses none of the aforedescribed disadvantages. To attain this, the present invention contemplates a novel safety mechanism of the centrifugal type which will prevent arming of a fuze when the projectile is subjected to abnormal rotation.

It is therefore an object of this invention to provide a new and improved safety mechanism for a projectile fuze or detonating device.

Another object is to provide a force discriminating mechanism in a projectile fuze for preventing arming of the fuze under predetermined conditions of rotation of the projectile.

A further object is the provision of a safety mechanism for a projectile fuze for preventing arming of the fuze when the projectile is subjected to abnormal rotation, while allowing fuze arming when there is normal linear motion of the projectile.

Still another object is to provide a safety mechanism for a projectile fuze or the like which is simple, compact and reliable in operation.

Other objects and various further features of novelty and invention will be apparent to those skilled in the art from a reading of the following specification and claims in conjunction with the accompanying drawing, which shows, for illustrative purposes only, one form of the invention and in which:

FIG. 1 is an elevational view, partly in section, of one embodiment of the invention;

FIG. 2 is a plan view of a portion of the apparatus shown in FIG. 1; and

FIG. 3 is an enlarged end view, partly in section, of a portion of the apparatus shown in FIG. 1.

In the illustrated example of the invention, and referring first to FIG. 1, there is shown a housing **11** for a fuze that is externally threaded at **12** so as to be mounted within a projectile head. The housing **11** has an open end **13** that is interiorly threaded to receive therewithin an exteriorly threaded cap **14** for the closure thereof. A guide tube **15** is rigidly mounted within the fuze housing **11** and is provided with longitudinally extending slots **16** and **17** on opposite sides thereof. Mounted within the guide tube **15** is a lever member **18** comprising two halves **19** and **20** which are rigidly joined together by a center pin **22**, as shown in FIGS. 2 and 3.

Referring now to FIGS. 1 through 3, pins **23** and **24** are rigidly mounted on the lever halves **19** and **20**, respectively, and the pins are pivotally mounted within the longitudinal slots **16** and **17**, respectively, formed in the tube. A retaining ring **21** is mounted on the guide tube **15** adjacent the protruding portions of the pivot pins **23** and **24**, thereby allowing rotation of the pins and limiting the axial movement thereof. The retaining ring **21** may be welded to the guide tube **15** or may be rigidly attached thereto by other similar methods.

A cylindrical member **25** is rigidly attached to the pin **24** and is slotted at **26** to slideably receive the end portion **27** of a locking tab **28**. The tab **28** is secured to the cylindrical member **25** by rivets **29** passing through the member **25** and the end portion **27**. In the assembled position, as shown in FIG. 1, the locking tab **28** is located within a slot **31** in the rotor **32** to prevent substantial rotation of the rotor which is part of the acceleration-responsive arming mechanism of the fuze. In order to arm the fuze, the rotor **32**, as shown in FIG. 1, must rotate in a clockwise direction approximately 60° from the assembled position shown in FIG. 1. Therefore, when the locking tab **28** is within the rotor slot **31**, this will prevent arming of the fuze.

Mounting pins **33** and **34** are retained in holes **35** and **36**, respectively, in the lever halves **19** and **20**. The wire rod **37** is pivotally mounted at one end on the mounting pin **33**, and at the other end thereof the rod is provided with a circular loop **38** which is received in a groove **39** formed in the spherical weight **41**. A second wire rod **42**, shorter than the rod **37**, is pivotally mounted at one end on the mounting pin **34**, and is provided with a circular loop **43** at the other end thereof which is received in a groove **44** formed in the spherical weight **45**. It is noted that the weight **41** has a central bore **46** therethrough to compensate for the longer length of the wire rod **37**. Therefore, the total weight of the wire rod **37** and the spherical weight **41** is equal to the total weight of the shorter rod **42** and the spherical weight **45**.

In operation, when there is normal linear acceleration of the projectile head, the force of the spherical weight **45**, shorter wire rod **42** and the locking tab **28** is greater than the force of the longer rod **37** and the spherical weight **41** upon the lever member **18**. This will result in a clockwise rotation of the lever member **18** to the dotted line position shown in FIG. 1, with a resulting clockwise rotation of the locking tab **28** to its dotted line position. Accordingly, the rotor **32** will be free to rotate and the acceleration arming mechanism will be capable of arming the fuze.

On the other hand, if there is abnormal or inadvertent rotation of the projectile head, such as end-over-end tumble, since the spherical weights **41** and **45** are both located rearwardly of the center of gravity of the projectile head and at significantly different distances therefrom, a greater centrifugal force will be exerted upon the spherical weight **41**, since it is farther from the projectile head center of gravity, which will cause the lever member **18** to be retained in the assembled position shown by the solid lines in FIG. 1. Since the locking tab **28** is retained within the slot **31** in the rotor **32**, the rotor is prevented from rotating in a clockwise direction and the acceleration arming mechanism is prevented from arming the fuze. Thus, a force discriminating mechanism is provided by this invention which wll allow acceleration-arming of a projectile fuze only when the projectile head is subjected to normal linear acceleration.

It is noted that although many alternate constructions of the present invention are possible, a few in particular may deserve mention. For example, a system of two racks with a pinion as a center fulcrum and heavy ends on the extremes of the racks could be readily employed; the construction of the lever member could be varied to a large degree; and the shape of the other components of the subject construction, such as the locking tab, the rotor slot, and the shape of the weights and guide tube, could be widely varied without departing from the scope of the invention.

While the invention has been described in detail for the illustrated form shown, it will be understood that many other modifications may be made within the scope of the invention as defined in the appended claims.

What is claimed is:

1. Safety apparatus for a fuze in the head of a projectile comprising means for arming the fuze in response to linear acceleration of the projectile, and means for preventing operation of said arming means when the projectile is subjected to abnormal or inadvertent end-over-end rotation, whereby the fuze will be armed only when the projectile is subjected to normal linear acceleration.

2. Force discriminating apparatus for a fuze in the head of a projectile comprising means for arming the fuze in response to linear acceleration of the projectile, locking means for preventing operation of said arming means when the projectile is subjected to abnormal or inadvertent end-over-end rotation, and means for releasing said locking means and allowing operation of said arming means only when the projectile is subjected to normal linear acceleration.

3. The apparatus of claim 2 wherein said arming means comprises a rotor mounted within the fuze and having a slot therein.

4. The apparatus of claim 3 wherein said locking means comprises a lever pivotally mounted within the fuze and having a locking tab thereon which normally extends into said rotor slot to prevent the rotation of said rotor necessary for the arming of the fuze.

5. The apparatus of claim 4 wherein said releasing means comprises a first rod pivotally mounted at one end thereof on said lever on one side of the lever pivot point and having a first weight mounted on the other end thereof, a second rod pivotally mounted at one end thereof on said lever on the opposite side of said lever pivot point and having a second weight mounted on the other end thereof, said rods extending in opposite directions from the lever, said first and second weights being on the same side of and at different distances from the center of gravity of the projectile head, and means to guide the movement of said weights.

6. Safety apparatus for a fuze mounted in the head of a projectile comprising a supporting tube rigidly mounted within the fuze, a lever member pivotally mounted within said tube, a pair of opposing connecting rods within said tube pivotally mounted 180° apart on said lever adjacent the outer edge thereof on opposite sides of the lever pivot point and extending in opposite directions from said lever, said rods being of different lengths and each having a spherical weight mounted on the free end thereof, said weights being freely movable within said tube and being on the same side of and at different distances from the center of gravity of the projectile head, means for arming the fuze in response to linear acceleration of the projectile, and locking means rigidly mounted on said lever member for preventing operation of said arming means when said weights are subjected to different acceleration forces respectively and resulting from abnormal or inadvertent end-over-end rotation of the projectile head, whereby the fuze will be armed only when the projectile is subjected to normal linear acceleration.

7. The apparatus of claim 6 wherein said arming means comprises a rotor mounted within the fuze and having a slot therein.

8. The apparatus of claim 7 wherein said locking means comprises a tab whch normally extends into said rotor slot to prevent rotation of said rotor and therefore operation of said arming means.

9. The apparatus of claim 6 wherein the spherical weight mounted on the longer of said rods has a bore therethrough, whereby the weight of said longer rod and said weight mounted thereon is equal to the weight of the shorter rod and the weight mounted thereon.

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