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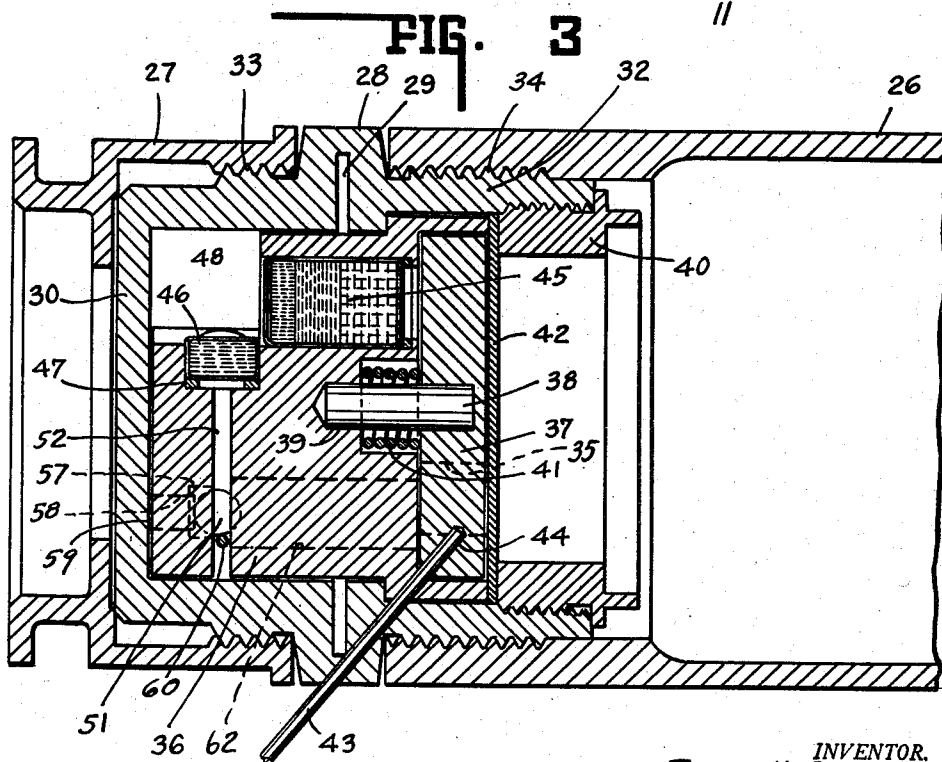
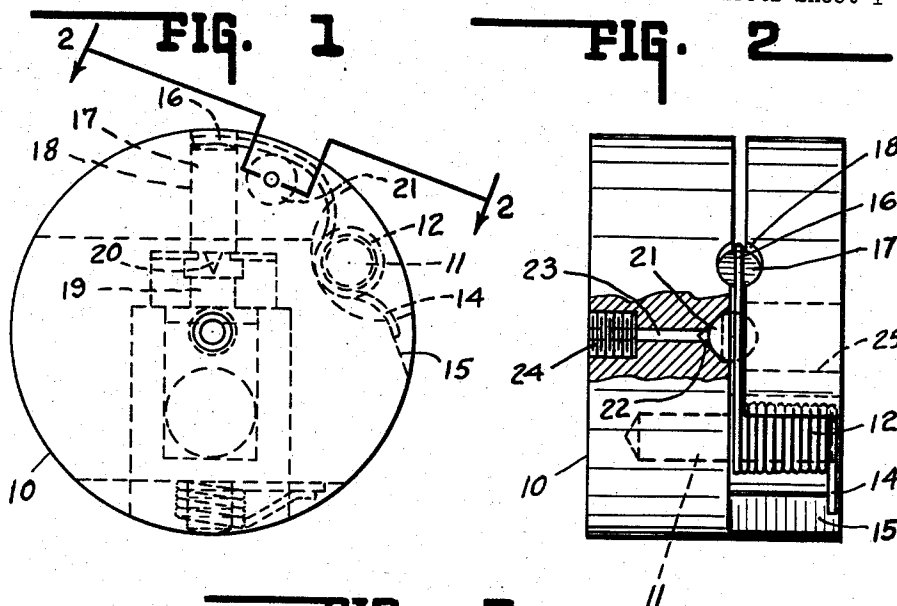
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MEANS FOR INITIATION OF DETONATOR

Filed May 19, 1954

2 Sheets-Sheet 1



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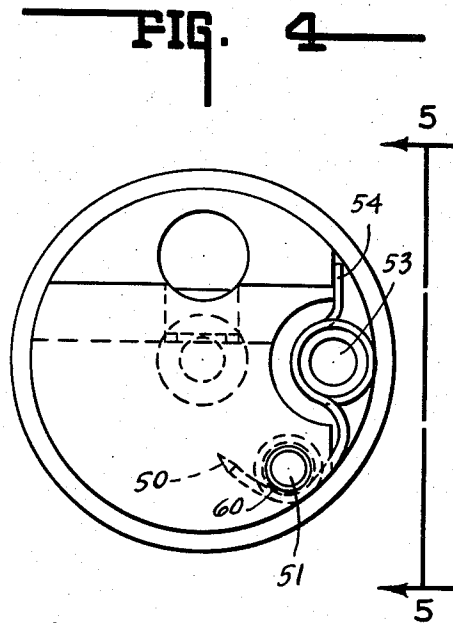
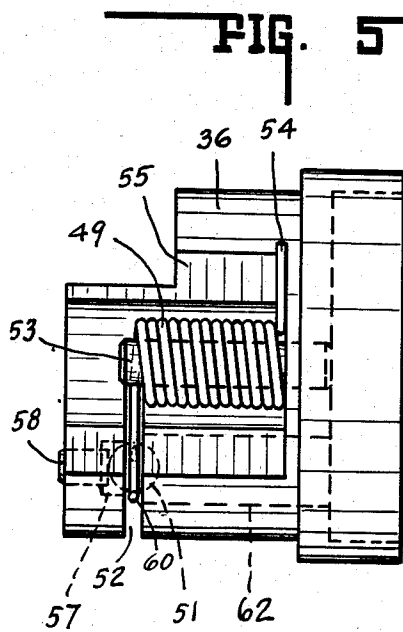
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MEANS FOR INITIATION OF DETONATOR

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5 Claims. (Cl. 102—73)

This invention relates generally to fuses, and more particularly to a means for initiating the detonation of a fuse.

Conventional fuses consist of a mechanism responsive to shock which may be screwed into the nose end of a projectile or rocket casing. Such fuses actually form the extreme tip of the casing. Because of the threaded connection it is possible for fluids, air or other gases to penetrate within the casing and thereby to cause deterioration of the various components enclosed within the casing. Of course, this shortens the storage life of projectiles and rockets and makes them unreliable even though stored for comparatively short periods.

It is desirable to completely enclose the fuse mechanism within the casing of a projectile or rocket and, therefore, the mechanism must be relatively small and fit within a very small space. It also must be assembled within the casing of the rocket and projectile at the time that the rocket is manufactured. Since this is true, the mechanism must be relatively insensitive to ordinary shocks which may occur during transportation and storage. On the other hand, the mechanism must respond to a high velocity shock such as that which would occur when the projectile or rocket impacts a target. At the same time, impact with a target must not destroy the mechanism and prevent its functioning.

Accordingly, it is the principal object of this invention to provide a simple and small means for initiation of the detonator which may be housed within the casing of a relatively small projectile or rocket.

It is another object of this invention to provide a means for initiation of a detonator which is insensitive to normal shocks but sensitive to high velocity shocks such as those occurring upon impact with a target.

Another object of the invention is to provide a means for initiation of a detonator having the characteristics described in the foregoing objects and also being extremely strong and resistant to shocks such as those sustained upon impact with a target.

In accordance with this invention there is provided a means for initiation of a detonator comprising a firing mechanism, means for storing energy, and a weight member responsive to shock of predetermined degree for releasing said stored energy and operating said firing mechanism.

There is also provided in accordance with this invention a means for initiation of a detonator comprising a torsion firing device, a weight normally restraining said firing device and means responsive to shock of predetermined minimum value for displacing said weight and releasing said firing member.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims.

Fig. 1 is a side elevation view illustrating this invention.

Fig. 2 is a plan view taken from the direction indicated by line 2—2 of Fig. 1.

Fig. 3 is a longitudinal cross section of an improved

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modification of the invention illustrated in Figs. 1 and 2. Fig. 4 is an end elevation view taken from the left hand side of Fig. 3.

Fig. 5 is a side elevation view taken from the direction indicated by line 5—5 of Fig. 4.

In Figs. 1 and 2 of the drawings there is shown a means for initiation of a detonator consisting of a body member 10 in which is fixed a pin 11 adapted to support a torsion spring member 12. One end 14 of the spring 12 bears on a shoulder 15 formed in body member 10. The other end 16 of spring 12 bears on a firing pin 17 mounted within a bore 18 in body 10 and movable into contact with a primer 19, for example. The pin 17 is provided with a point 20 for stabbing the detonator and exploding it.

For restraining the spring 12 and holding it in the position shown in Figs. 1 and 2, there is provided a metallic ball 21 normally resting in socket 22 formed within the body member 10. For positioning and retaining the ball 21 in a position with its center to the left of spring 12, there is provided a pin 23 and a set screw 24. Set screw 24 may be adjusted to act as a stop in cooperation with pin 23, thereby to hold the ball with its center at a desired distance beyond the spring 12.

Body 10 is provided with a bore 25 opposite the ball 21 for permitting ball 22 to move in a forward direction into the bore 25.

In operation the body portion 10 is mounted within a projectile casing with the bore 25 facing toward the nose of the projectile or rocket. Upon impact with a target, ball 21, because of its inertia, lifts spring 12 and then moves out from under spring 12, whereby it is released to force the firing pin 17 into contact with the detonator 19.

Normal shocks occurring during transportation or handling are insufficient to dislodge the ball 21 due to the fact that it must initially lift spring 12 which is already under torsion and exerting a downward force. This downward force is sufficient normally to retain ball 21 at rest against the wall of socket 22.

Fig. 3 illustrates another modification of this invention wherein it is incorporated in a detonator having a shutter for arming of a projectile or rocket. The detonator may be mounted between a nose portion 26 of a rocket or projectile and a collar member 27 adapted to be connected to the propellant containing casing of a rocket, for example.

The detonating mechanism comprises a shock responsive member 28 which may be grooved interiorly thereof, as at 29, whereby the rear cup portion 30 can move in response to shock relative to the forward extending flange 32. Cup 30 may be threaded at 33 for attachment to collar 27, while a forward extending flange 32 may be threaded at 34 for attachment to the nose portion 26. Thus, when nose portion 26 impacts the target, the resulting shock causes relative movement between the cup 30 and the flange 32.

The block 36 may be mounted within cup 30 for rotatably supporting a shutter device 37 on a shaft 38 rotatably mounted within the bore 39 in block 36. For rotating the shutter 37 there is provided a coiled spring 41, one end (not shown) of which may be embedded in block 36 and the other end (not shown) of which may be embedded in shutter 37. For holding shutter 37 on pin 38 against spring 41, there is provided a collar 40, threaded to forward extending flange 32, as shown, for retaining a disc 42 in contact with the forward edge of body member 36. A release pin 43 may be mounted in the member 28 to project outwardly thereof and inwardly thereof and to extend into a bore 44 in shutter 37 for normally locking the shutter in a spring wound position. Thus, pin 43 may be withdrawn prior to firing of

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the projectile or rocket to permit shutter 37 to rotate into such a position that an aperture 35 in shutter 37 may expose a detonating charge 45 to the main explosive charge contained within nose portion 26.

In order to set off the detonating charge 45 there is provided a primer 46 mounted in a socket 47 in the block 36, and facing into a chamber 48 into which the detonator 45 also faces. When primer 46 explodes, it in turn provides a flash and/or pressure for exploding detonator 45.

In order to explode the primer 46, there is provided a firing pin in the form of a wound spring 49 (Figs. 4 and 5) having a sharpened end 50 normally held in a cocked position within slot 52 by means of the ball 51. The spring 49 may be wound on a post 53 mounted in block 36, one end 54 of the spring engaging a flat shoulder 55 in block 36. Thus, it will be obvious that ball 51 can hold the spring in wound position as illustrated in Figs. 4 and 5.

Ball 51 may be mounted in a socket 57 adjacent slot 52 in engagement with a movable pin 58 extending between ball 51 and the inner surface 59 of cup 30. It should be noted that the pointed end 50 of spring 49 extends into the slot 52 in block 36 and engages ball 51 to the right of its center, whereby the ball is forced to the left of the spring and held in the position shown in Fig. 3. In order to permit the ball 51 to move out of engagement with spring 49 there is provided a chamber 62 in block 63 in axial alignment with ball 51, and opening into slot 52.

In operation, the detonating mechanism is normally in the position illustrated in Fig. 3 where the shutter 37 blocks the detonating charge 45 from the main explosive charge within nose portion 26. In case of any accidental explosion of detonator 45, the flash therefrom can not pass to the main charge and thus the projectile or rocket is normally in a disarmed condition.

When the rocket or projectile is about to be launched, pin 43 may be withdrawn, permitting spring 41 to drive shutter 37 into a position where the passage 35 moves into alignment with the detonator 45, providing communication between detonator 45 and the main explosive charge.

The rocket or projectile may then be launched and upon impact with the target the thin wall portion of member 28 opposite slot 29 permits flexure within member 28, whereby the cup portion 30 moves forward with respect to the forward extending flange 32. The effect of this is to move the pin 58 in a forward direction against ball 51 imparting a pulse thereto, dislodging the ball into chamber 62, whereupon the firing pin is released, and the pointed end 50 thereof impacts primer 46 causing detonation and explosion.

It should be noted that because of the off center relationship between the ball 51 and the firing pin normal shocks occurring during handling and transportation do not cause release of the firing pin. This is because the ball in moving forward must first overcome the pressure exerted thereon by the pin 60 and move it outwardly with respect to primer 46. Normal shocks are not powerful enough to cause such movement and, therefore, this arrangement is relatively safe. On the other hand, the severe shocks occurring upon impact of the projectile with the target are sufficient to cause movement of ball 51 completely into the chamber 62 to release the firing pin.

The invention claimed is:

1. Apparatus for initiating a detonator of a weapon comprising a cup member having a rear threaded portion for receiving a propellant containing casing, a forward threaded portion for receiving a war head, and a mid portion connecting said forward and rear threaded portions and having a relatively thin wall portion adapted to flex in response to impact of said war head with a target;

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a detonator supporting block supported within the rear threaded portion of said cup member; a firing mechanism comprising a pin mounted in said block and a spring for moving said pin through a certain path; said block including a socket adjacent said path and a ball supported in said socket in off center relation to the rear of said firing mechanism and in its path of movement; and an actuating pin mounted in said block to form the rear wall of said socket and engaging the rear portion of said cup member for dislodging said ball in response to flexure of said thin wall portion.

2. Apparatus for initiating a detonator of a weapon comprising a cup member having a mid portion in the form of a relatively thin wall adapted to flex in response to impact with a target; a detonator supporting block supported within said cup member; a firing mechanism comprising a pin mounted in said block and a spring for moving said pin through a certain path; said block including a socket adjacent said path and a ball supported in said socket in off center relation to the rear of said firing mechanism and in its path of movement; and an actuating pin mounted in said block to form the rear wall of said socket and engaging the rear portion of said cup member for dislodging said ball in response to flexure of said thin wall portion.

3. Apparatus for initiating a detonator of a weapon comprising a casing, a cup member mounted in said casing and having a relatively thin wall portion adapted to flex in response to impact of said casing with a target; a detonator supporting block supported within said cup member; a firing mechanism comprising a pin mounted in said block and a spring for moving said pin through a certain path; said block including a socket adjacent said path and a ball supported in said socket in off center relation to the rear of said firing mechanism and in its path of movement; and an actuating pin mounted in said block forming the rear wall of said socket and engaging a portion of said cup member for dislodging said ball in response to flexure of said thin wall portion.

4. Apparatus for initiating a detonator of a weapon comprising a casing, a first wall in said casing, a relatively thin wall portion in said casing connected to said first wall and adapted to flex in response to impact of said casing with a target; a detonator support within said casing; a firing mechanism comprising a pin mounted in said support and a spring for moving said pin through a certain path; said support including a socket adjacent said path and a weight supported in said socket in off center relation to said firing mechanism and in its path of movement; and an actuating pin connecting said socket and engaging said first wall for dislodging said weight in response to flexure of said thin wall portion.

5. Apparatus for initiating a detonator comprising a casing having a relatively thin wall portion adapted to flex in response to impact with a target; a detonator supporting member supported within said casing; a firing mechanism comprising a pin mounted in said member and a spring for moving said pin through a certain path; said member including a socket adjacent said path and a weight supported in said socket in the path of movement of said mechanism; and an actuating pin mounted in said member adjacent to said socket and connected with said thin wall portion for dislodging said ball in response to flexure of said thin wall portion.

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