Sept. 26, 1961 H. T. HODGES 3,001,475

TIME DELAY MEANS FOR A HAND GRENADE

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FIG.1.

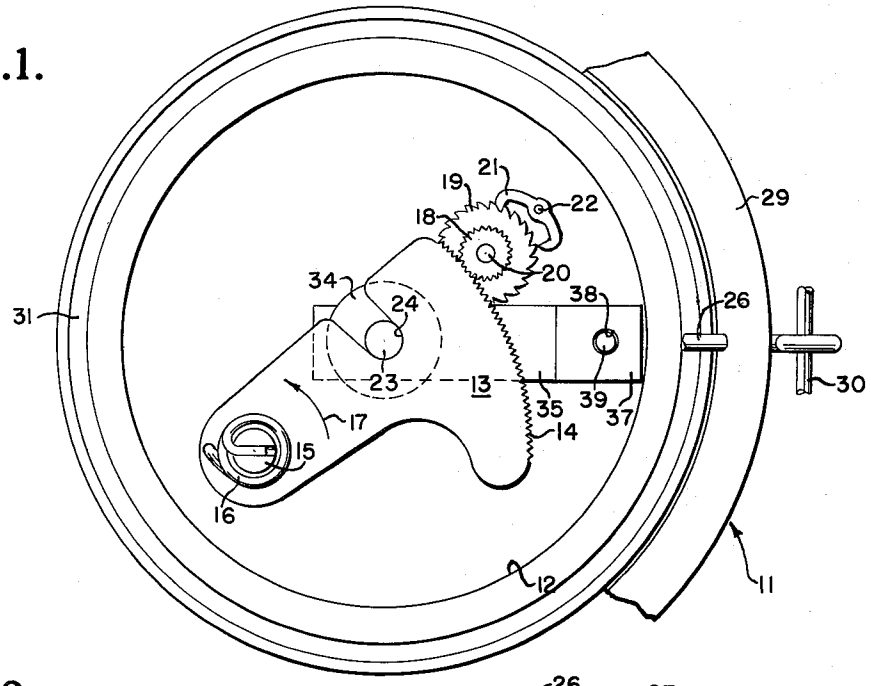
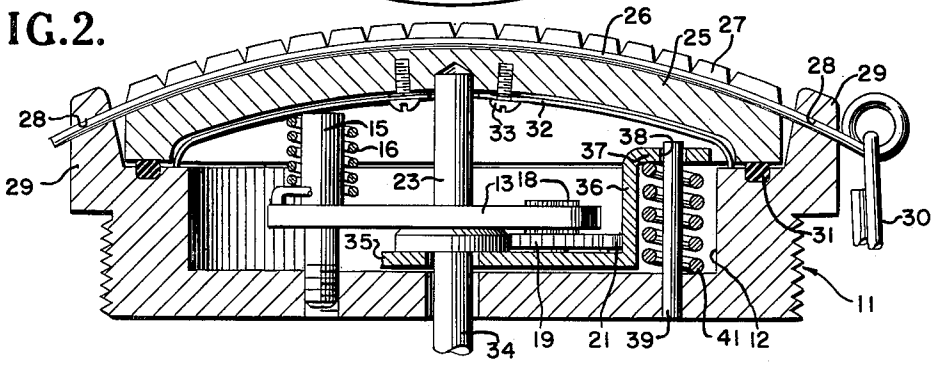


FIG.2.



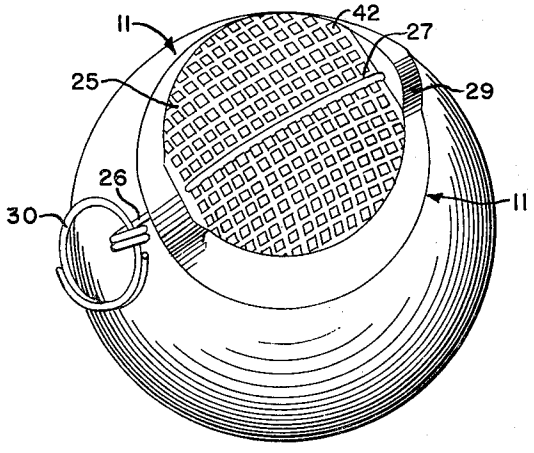


FIG.3.

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TIME DELAY MEANS FOR A HAND GRENADE

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The present invention relates to a time delay mechanism for hand grenades and more particularly to an escapement type time delay mechanism for hand grenades in which a spring-urged sector gear covers and retains an arming pin in safe position, movement of the sector gear under the control of an escapement mechanism serving to uncover the arming pin, whereby the arming pin may be withdrawn and the hand grenade becomes armed in time-delayed sequence after the hand grenade has been thrown.

In one known form of hand grenade, the arming delay is achieved through the use of a metallic cover or cap connected to the arming pin by means of a coiled length of string, the cap being forced away from the body of the hand grenade by a spring as the thrower's grip on the cap is eased during the act of throwing. The cap, acted upon by the aerodynamic and/or centrifugal forces existing in flight, functions as a parachute to unwind the string and pull out the arming pin connected thereto, thereby arming the hand grenade. The arming delay is thus a function of the rate of separation of the cap with respect to the grenade body and varied under different throwing techniques, which was a disadvantage in that the time delay was not certain or fixed.

Essentially, the present invention consists of an escapement type delay mechanism for a hand grenade in which the arming delay time can be fixed and which does not change with varying throwing techniques, the escapement mechanism consisting of a pivoted sector gear which retains the arming pin in safe position, movement of the sector gear being controlled in desired time sequence by the escapement mechanism to uncover the arming pin, whereby the pin may be withdrawn by spring-urged means and the hand grenade becomes armed.

It is therefore an object of this invention to provide a hand grenade having a fixed arming delay time which does not change with varying throwing techniques.

Another object is the provision of a new and improved escapement type time delay mechanism for a hand grenade, the mechanism having movable parts which are held immobile by a stop or retaining pin secured to a detachable cap or cover.

A further object is to provide novel escapement type time delay mechanism for a hand grenade comprising a pivoted plate and means controlling pivotal movement of the plate.

Still another object is the provision, in a hand grenade, of a new and improved time delay mechanism comprising a pivoted spring-urged sector gear and an escapement means controlling pivotal movement of the sector gear.

Other objects and features of the invention will become apparent to those skilled in the art as the disclosure is made in the following detailed description of a preferred embodiment of the invention as illustrated in the accompanying sheet of drawing in which:

FIG. 1 is a plan view of the time delay mechanism of this invention;

FIG. 2 is an elevational view, partly in section, of the time delay mechanism of this invention shown housed in a hand grenade fuze body, the cap of the fuze body having a pin holding the parts of the time delay mechanism immobile; and

FIG. 3 is a perspective view of one type of hand grenade in which the time delay mechanism of this invention may be incorporated.

Referring now to FIGS. 1 and 2 of the drawing, wherein like reference numerals designate like or corresponding parts, there is illustrated in FIG. 1 a plan view of the time delay mechanism of this invention incorporated in a hand grenade fuze body, the latter being shown in fragmentary form and generally designated by numeral 11. The fuze body is formed with a cavity 12 which houses the time delay mechanism. The time delay mechanism comprises a plate or sector gear 13 having an arcuate toothed edge or rack 14 and is journalled on a stub shaft 15, the stub shaft being fixed to the bottom of the cavity 12 of the fuze body, as better shown in FIG. 2. Encircling the stub shaft is a coil spring 16, one end of which is fixed to the stub shaft with the other end thereof being attached to the plate or sector gear 13, the spring being wound or coiled about the stub shaft in a manner to cause pivotal movement of the plate or sector gear 13 in the direction of the arrow 17, as shown in FIG. 1. Meshing with toothed edge 14 of the sector gear is a pinion 18 fixed to an escapement wheel 19, the pinion and escapement wheel being jouralled upon a shaft 20 fixed in the bottom of cavity 12 of the fuze body. Cooperating with the escapement wheel 19 is an escapement anchor 21 supported upon a suitable pivot means 22, the pinion 18, escapement wheel 19 and escapement anchor 21 serving to control pivotal movement of the plate or sector gear 13 in time-delayed sequence in response to the urging of spring 16.

The plate or sector gear is held immobile or locked in the position shown in FIG. 1 by means of a stop or retaining pin 23 engaging in a notch 24 formed in the plate, the stop pin 23 being securely mounted on a detachable cap or cover 25 and the pin 23 and cap 25 being held in plate locking position by a retaining wire 26 which is received in a groove 27 formed in and extending across the cap. The retaining wire 26 passes through a pair of oppositely disposed openings 28 provided in and extending through an annular flange 29 forming the upper portion of the fuze body. The retaining wire 26 may be provided with a suitable finger ring 30 for withdrawing the wire by a pull thereon. A suitable gasket or seal 31 may be employed to prevent entry of moisture. To insure ejection of the stop or retaining pin 23, a leaf spring 32, or the like, is secured to the cover or cap 25 by suitable fastening means, such as screws 33, or other type fasteners.

In the immobilized or locked position of the plate or sector gear, that is, the position of the plate 13 shown in FIG. 1, the plate engages and bears against the head of an arming pin 34, thereby holding the pin in safe position maintaining the grenade in unarmed condition. As will be understood by those skilled in the art, arming pin 34 is operatively connected, in any suitable manner, to control arming means (not shown) in the grenade. The arming pin is supported on a member or bar 35 which has a leg 36 extending away from the bottom of cavity 12 of the fuze body. Leg 36 has a laterally directed extension 37 which is provided with an aperture 38 adapted to receive a guide post 39 secured to the bottom of the fuze body cavity. Coiled about guide post 39 is a compression spring 41 reacting or bearing against the cavity bottom and the lateral extension 37. Thus, spring 41 exerts force in a direction to forcibly withdraw arming pin 34 from safe position, while the sector gear, in the position shown in FIG. 1, prevents such withdrawal of the arming pin and thereby retains the arming pin in the unarmed or safe condition of the hand grenade.

In the operation of the device, the hand grenade is gripped so that the fingers of the thrower extend across the cover or cap 25, a firm grip for the fingers being provided by knurling 42 formed on the cap, as shown in FIG. 3. The retaining wire 26 is then withdrawn by pulling thereon, the pressure of the fingers pressing inwardly on the cap and holding the stop or locking pin 23 in position

immobilizing locking plate 13. As the hand grenade is thrown and the pressure of the fingers of the thrower eases on the cap of the grenade, spring 32 acts to eject the cover or cap 25 along with pin 23 from the fuze body, withdrawal of pin 23 from notch 24 initiating operation of sector gear 13. That is, the plate 13 is now free to move in the direction of arrow 17 in response to the urging of spring 16, its movement in the direction of the arrow being timed in accordance with the mass and dimensional relationships of the plate or sector gear and the escapement means comprised of elements 18—22. When the plate of sector gear 13 has pivoted or rotated sufficiently, the head of the arming pin 34 will be uncovered and spring 41 will forcibly urge member 35, and arming pin 34 carried thereby, away from the bottom of the cavity 12, thereby focibly withdrawing the arming pin 34 from safe position and arming the hand grenade.

From the foregoing, it should be apparent there has been provided a time delay mechanism for a hand grenade in which the time delay interval is controlled by an escapement means and depends upon the dimensional relations existing between the parts of the mechanism, thereby fixing the time length of the delay and providing a hand grenade with time delay mechanism which is independent of the techniques of the thrower of the hand grenade.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood the invention may be practiced otherwise than as specifically described.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. In a hand grenade having a housing and an arming pin supported for linear movement therein, an escapement type time delay mechanism therefor, said mechanism comprising, in combination, a bar in said housing engaging said pin, expandable spring means engaging said bar and housing for urging upon expansion thereof said bar and pin in a direction to forcibly withdraw the pin from a safe position, a plate supported for pivotal movement in said housing, means connected to said plate for urging pivotal movement thereof, a detachable cover for said housing, a stop carried by said cover and positioned to engage said plate for normally holding the plate in a locked position, said plate when in said locked position being disposed to constrain said spring means and obstruct withdrawal of said pin from said safe position, detachment of said cover and stop being effective to initiate pivotal movement of said plate to a deoppilant position to deobstruct said pin and enable expansion of said spring means thereby to effectuate forcible withdrawal of said pin from said safe position, and escapement means operatively connected to said plate for controlling pivotal movement thereof in predetermined timed sequence from said locked position to said deoppilant position whereby said pin is forcibly withdrawn and the hand grenade becomes armed a predetermined time after detachment of said cover and stop.

2. The combination recited in claim 1, further characterized in said plate having an arcuate rack and said escapement means including a pinion meshing with said rack.

3. The combination recited in claim 1, further characterized in said bar having a leg formed with a lateral extension, and said spring means being disposed between said leg and said housing and expandably reacting therebetween.

4. A hand grenade of the type described, comprising, in combination, a housing, an arming pin supported in said housing for sliding along a line of movement, a shaft secured in said housing and disposed with the longitudinal axis thereof parallel to said line of movement, a plate journalled on said shaft for pivotal movement in a plane perpendicular to said shaft axis and said line of movement, a coil spring encircling said shaft, the ends of said coil spring being connected to said shaft and plate respectively, said spring being adapted to urge said plate in a direction of pivotal movement, a detachable element normally retained on said housing, said element carrying lock means normally positional to prevent pivotal movement of said plate, said plate when held by said lock means being positioned to prevent sliding movement of said arming pin by engagement therewith and concurrently obstruct withdrawal of the arming pin from an initially safe position, escapement means geared to said plate in a manner to retard pivotal movement thereof, detachment of said element and lock means carried thereby releasing said plate for pivotal movement, release of said plate being effective to enable said spring to drive said plate to a position of disengagement from said arming pin, and means mechanically engaging said arming pin for withdrawing the arming pin from safe position after the plate has become disengaged from the arming pin.

5. A hand grenade as claimed in claim 4, said plate being formed with an arcuate toothed edge and constituting a sector gear, and said escapement means including a rotary toothed part engaging said arcuate toothed edge of said plate.

6. A hand grenade as claimed in claim 4, said last-named means including a bar member having a laterally directed extension with an opening formed therein, a guide post fixed in said housing and extending through said opening, and compression spring means encircling said post, said spring means expandably reacting between said housing and extensions.

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