United States Patent [19]

Mirlesse

[11] **3,842,740**

[45] **Oct. 22, 1974**

[54] **HAND GRENADE DETONATOR**

[75] Inventor: **Albert Mirlesse,** Geneva, Switzerland

[73] Assignee: **Interep Associes S.A.,** Geneva, Switzerland

[22] Filed: **May 14, 1973**

[21] Appl. No.: **360,077**

[30] **Foreign Application Priority Data**

May 18, 1972 Luxembourg 65387

[52] **U.S. Cl.** ..... **102/64,** 102/65.4, 102/70 S

[51] **Int. Cl.** **F42b 27/00,** F42c 15/02

[58] **Field of Search** ..... 102/64, 65, 65.4, 70 R, 102/70 S, 78, 81.6

[56] **References Cited**

UNITED STATES PATENTS

1,311,740	7/1919	Asbury	102/64
2,243,621	5/1941	Denoix	102/70 S
2,938,463	5/1960	Jasse	102/78
3,375,786	4/1968	Marchiaro	102/78
3,557,701	1/1971	Arnell	102/64

Primary Examiner—Benjamin A. Borchelt
Assistant Examiner—C. T. Jordan
Attorney, Agent, or Firm—Stevens, Davis, Miller & Mosher

[57] **ABSTRACT**

A hand grenade detonator includes a spring-urged inertia block and a spring-urged striker which are movable relative to a detent but are releasably locked by a system of balls and cooperating grooves. When the detent is depressed, against the action of a spring, the inertia block is freed and, if the grenade is subjected to a throwing action, moves to an arming position against the action of its spring; release of the detent as the grenade is thrown causes locking of the inertia block in the arming position and freeing of the striker which is moved by its spring to a detonation position.

4 Claims, 6 Drawing Figures

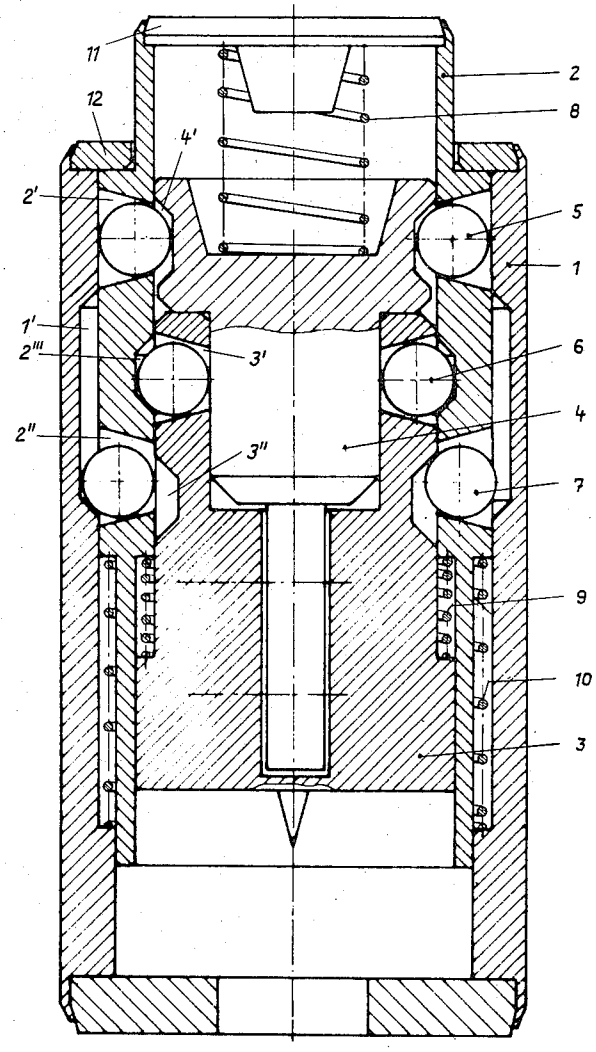


Fig. 1

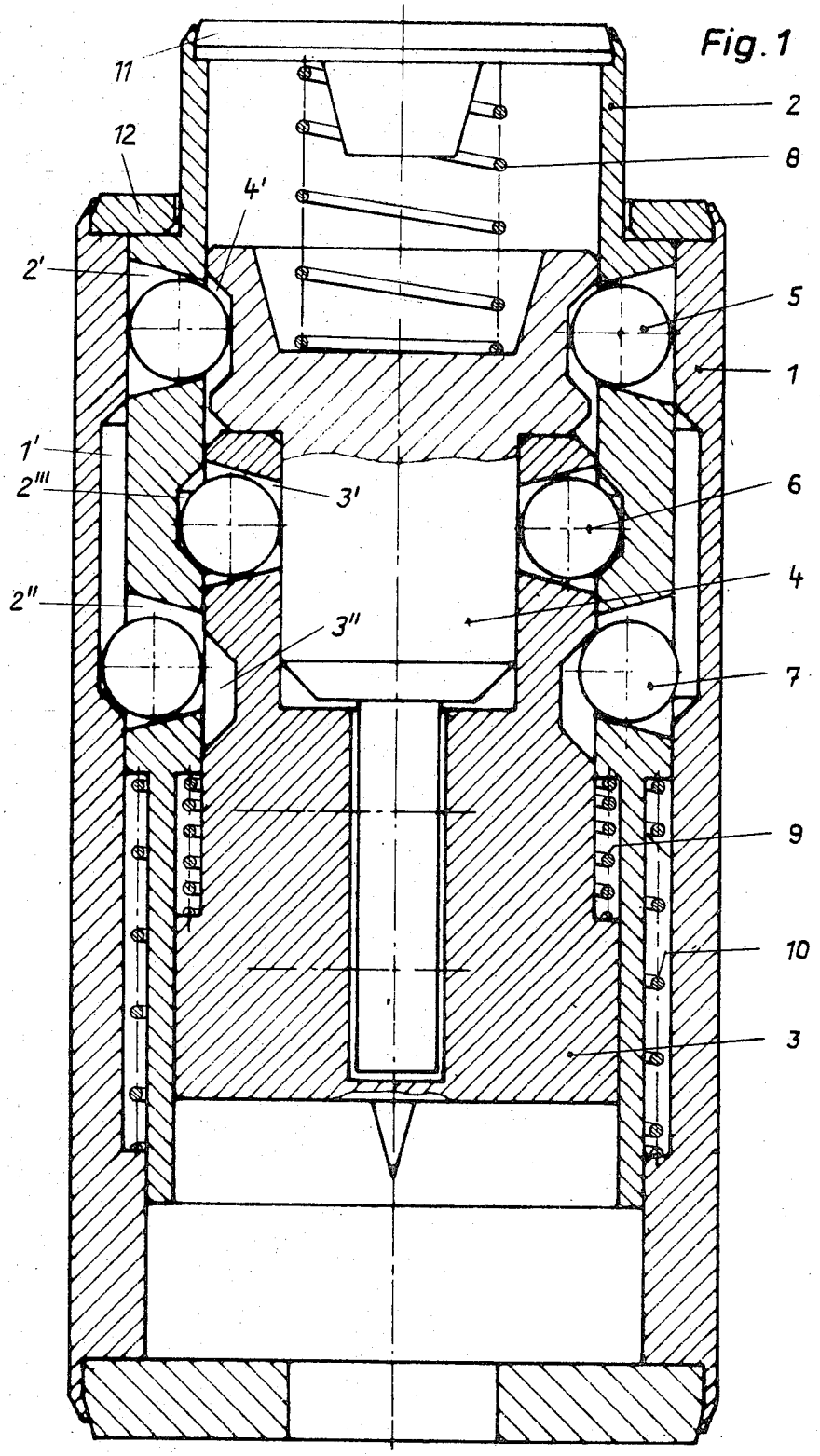


Fig.2

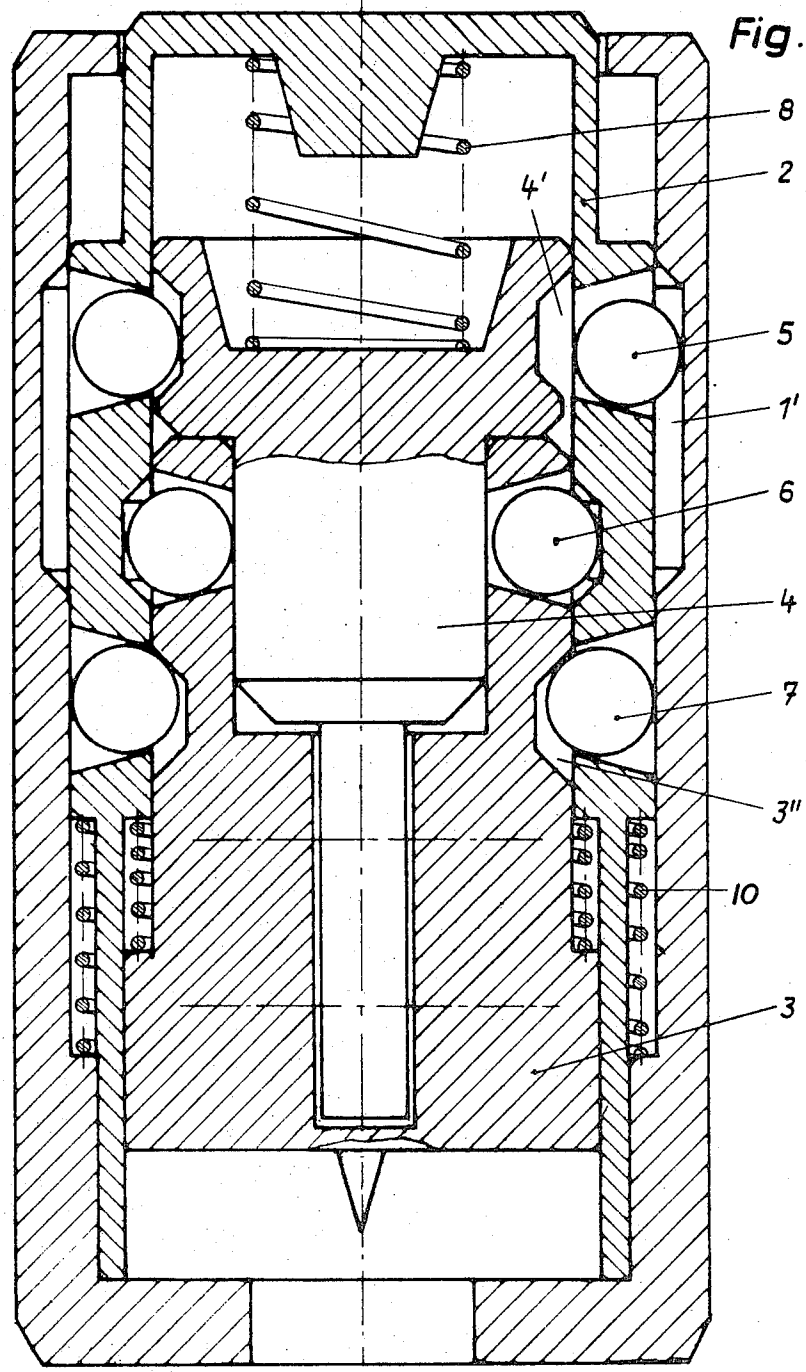


Fig. 3

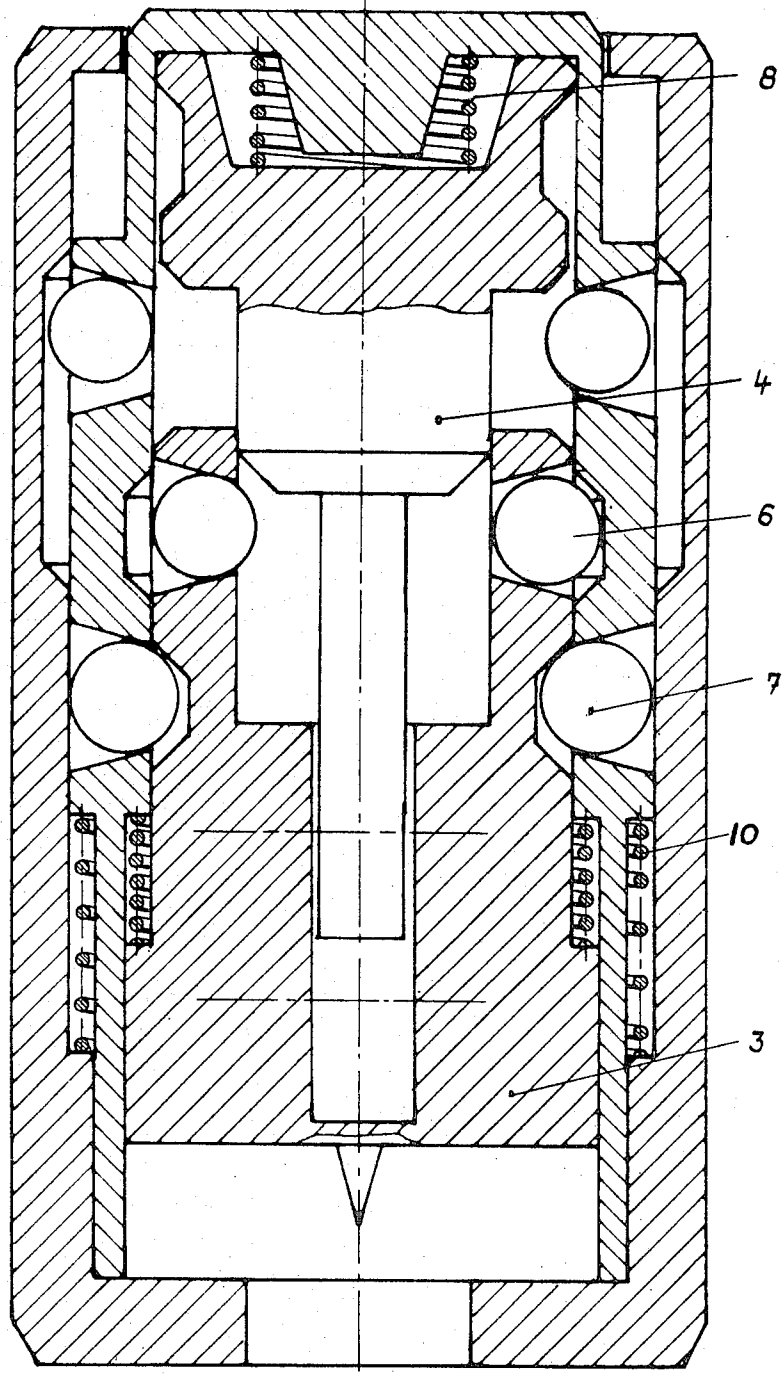


Fig. 4

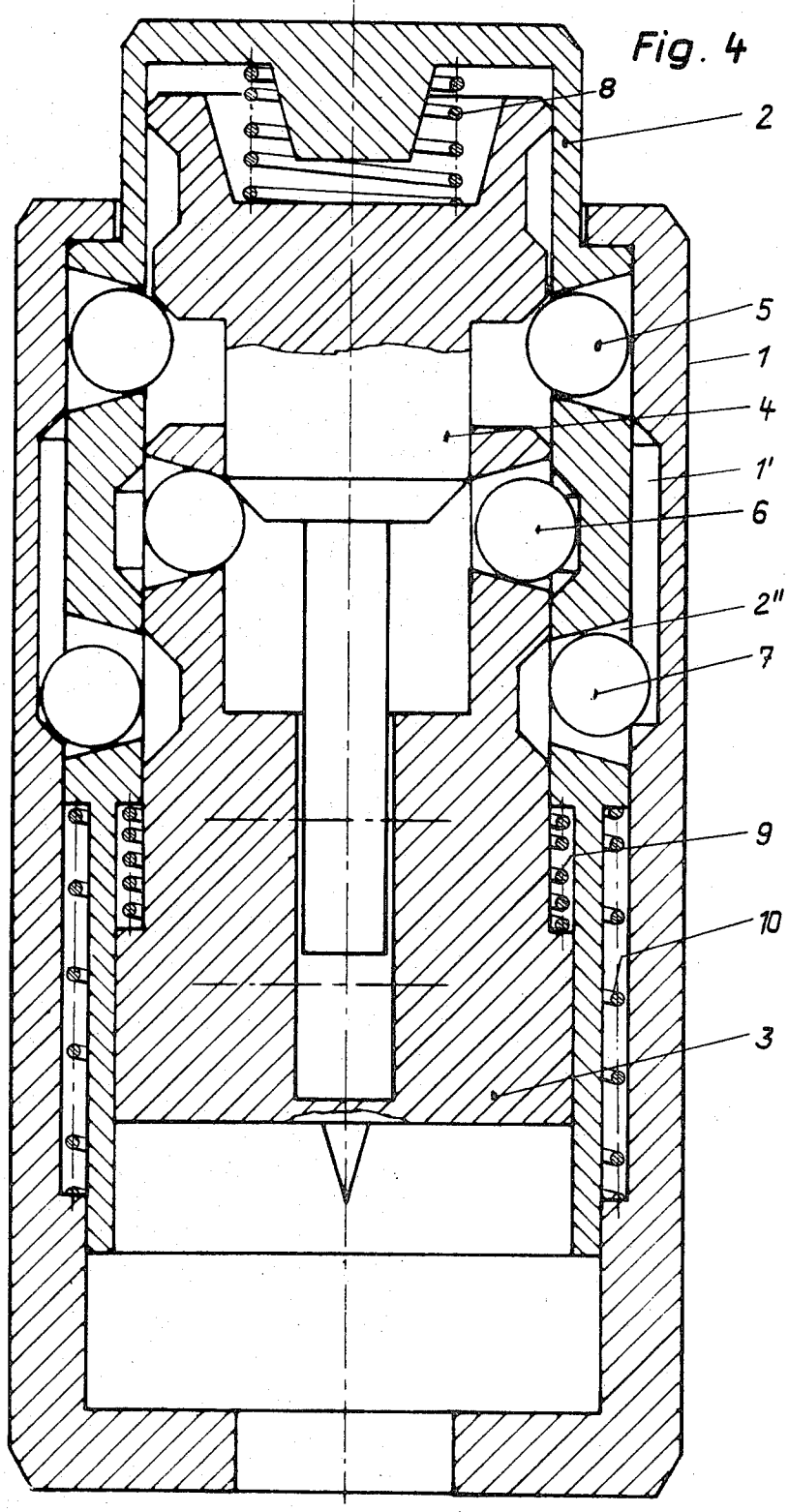


Fig.5

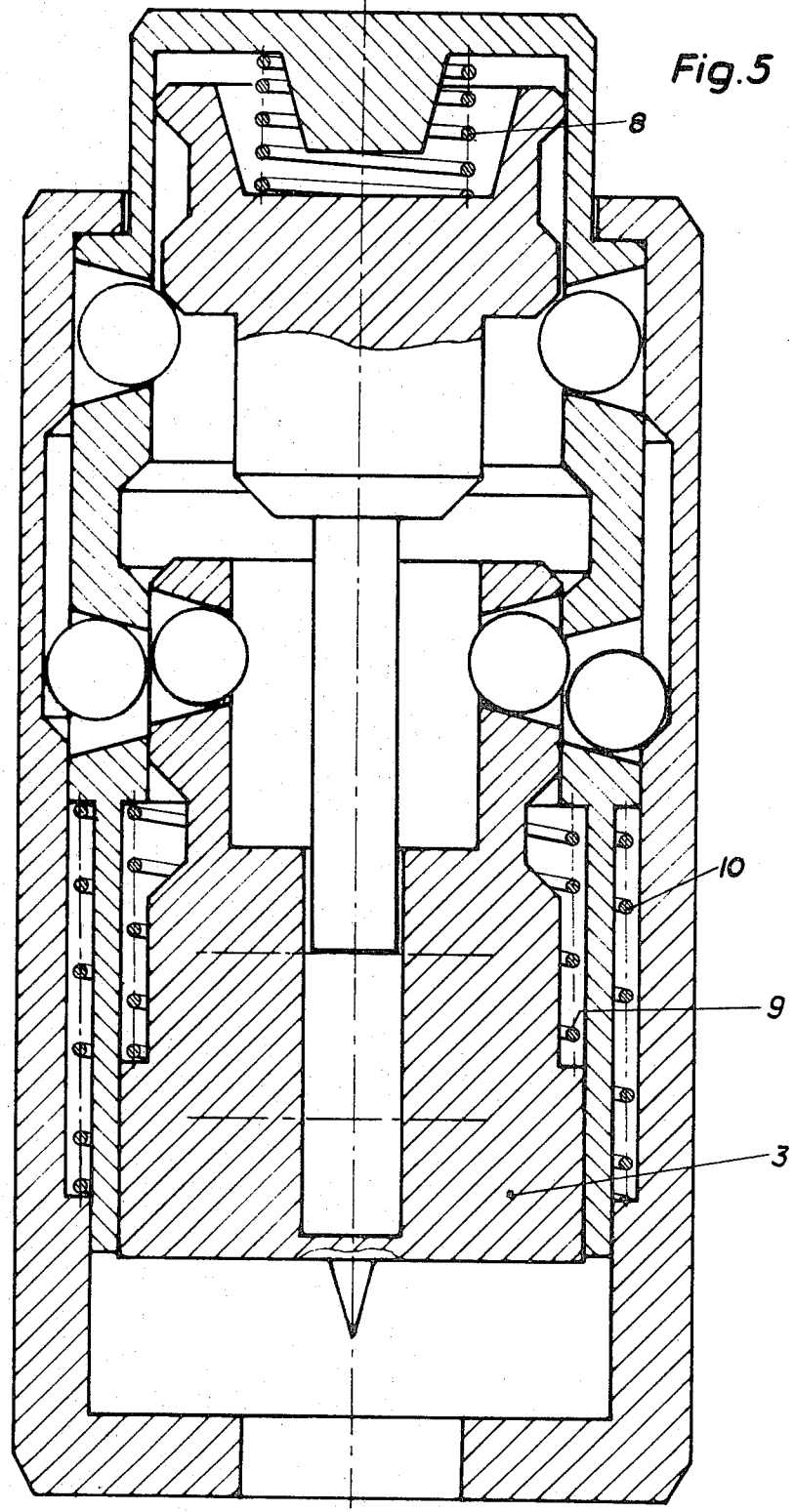
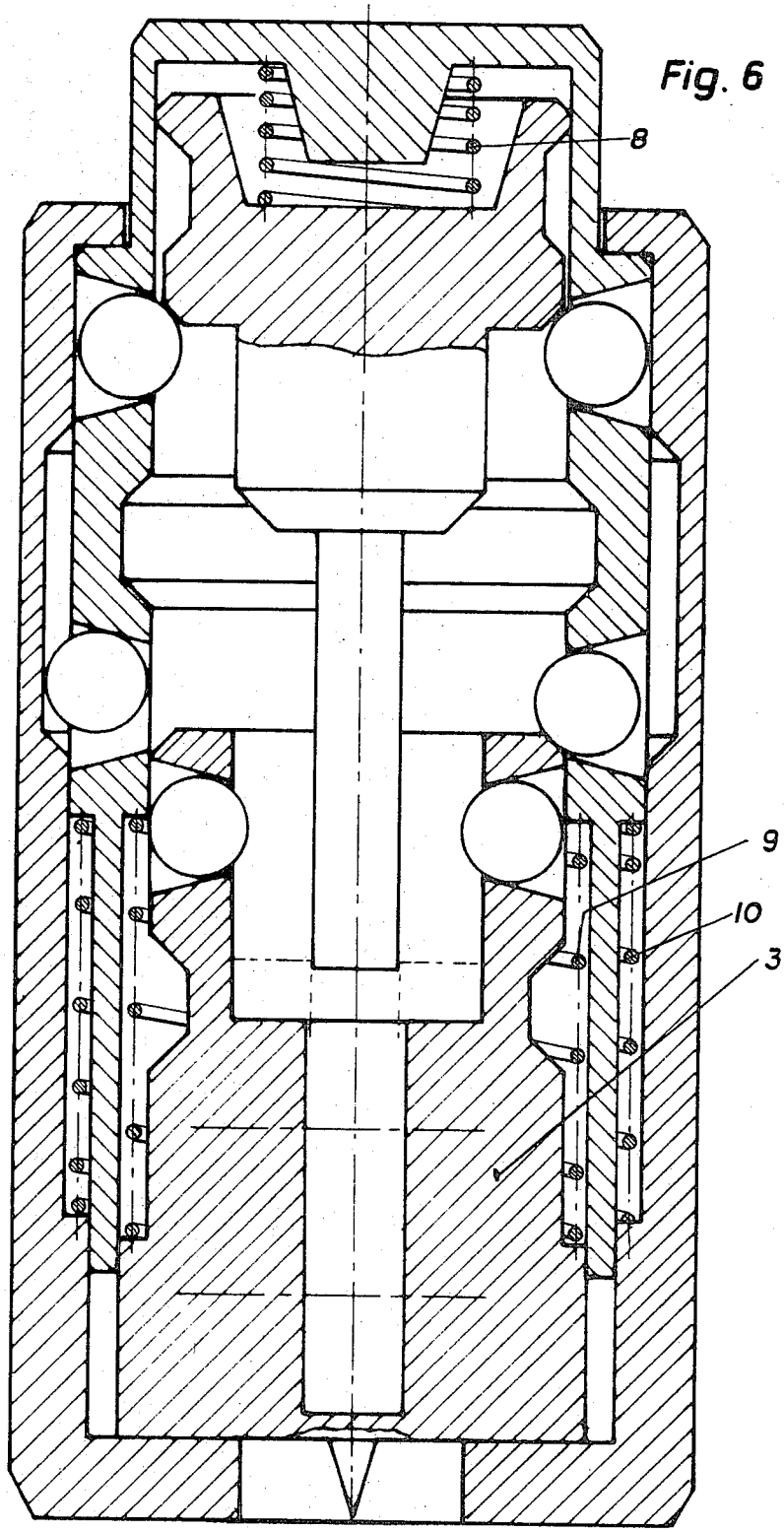


Fig. 6



HAND GRENADE DETONATOR

The present invention concerns hand grenade detonators.

A known type of hand grenade detonator includes spring-controlled means for actuating a striker, safety means for maintaining the striker actuating means in a pre-armed position and, in the absence of an acceleration resulting from a throwing movement, for automatically returning the striker actuating means into a safety position, and when this acceleration occurs, for moving the striker actuating means into an armed position.

The present invention aims to provide a detonator of the above-specified type which is particularly suitable for hand-thrown projectiles, is of reliable operation and is relatively simple to manufacture.

The detonator according to the present invention is characterized by a spring-urged detent, a spring-urged inertia block reacting to the acceleration of throwing, means for automatically returning the detent to a safety position in the absence of an acceleration which moves the inertia block, and means for freeing the inertia block after production of the acceleration so as to move it from the pre-armed position to the armed position in a manner such that said striker actuating means moves the striker into a detonation position.

In other terms, a hand grenade detonator according to the invention comprises a case, a manually operable detent movable relative to said case from a first positon to a second positon against the action of a first spring, an inertia block movable relative to said detent from a safe position to an arming position against the action of a second spring, a striker movable relative to said detent from a safe position to a detonation position under the action of a third spring, means for locking said inertia block and said striker in their respective safe positions when said detent is in its first position and during movement of the detent from its first to its second position, means for locking said striker in its safe position when said detent is in its second position, means for freeing said inertia block for movement from its safe to its arming positon against the action of said second spring by inertia when the detonator is subjected to a throwing acceleration while said detent is in its second position, means for locking said inertia block in its arming position when said detent returns from its second to its first position by releasing it while said inertia block is held in its arming position by said throwing acceleration,, and means for freeing said striker for movement from its safe to its detonation position when said detent returns to its first position with said inertia block locked in its arming position.

The accompanying drawings show, by way of example, an embodiment of the present invention. In the drawings:

FIG. 1 is a schematic axial cross-sectional view of detonator in a first position; and

FIGS. 2 to 6 are similar views of the detonator during successive phases of operation thereof.

The detonator shown in FIG. 1 in an initial, safe position comprises a tubular case 1, a tubular detent 2, a striker 3, an inertia block 4, inertia block balls 5, striker balls 6, detent balls 7, an inertia block spring 8, a striker spring 9 and a detent spring 10.

The detent 2 is slidably received in case 1 and is closed by a cap 11 at its upper end which is adapted to protrude from a hand grenade in which the case 1 is

fixed. A stop-forming ring 12 is fixed inwardly protruding from the upper end of case 1, and cooperates with a shoulder of detent 2 to limit the upward movement of detent 2. Two opposed facing longitudinal grooves 1′ are provided in the inner surface of case 1, and the detent 2 is provided with two opposed outwardly-flared openings 2′ receiving balls 5 and two opposed outwardly-flared openings 2″ receiving balls 7, the balls 5 and 7 being of greater diameter than the thickness of the wall of detent 2 in the vicinity of these openings. The inner surface of detent 2 is also provided with two opposed facing recesses 2‴. The inertia block 4 includes an upper portion closely slidably received within the detent 2, this upper portion having two recesses 4′ in opposite parts of its outer surface, and a lower portion of reduced width closely slidably received within a bore of the striker 3 in which are provided two opposed outwardly-flared openings 3′ receiving balls 6 which are of greater diameter than the thickness of the wall of the bored part of striker 3. Below the openings 3′, the striker also includes two grooves 3″ in opposite parts of its outer surface. The schematically indicated spring 8 is compressed in a housing defined between the cap 11 of detent 2 and the upper face of inertia block 4, and the schematically indicated springs 9 and 10 are compressed in tubular recesses defined respectively between cooperating shoulders of detent 2 and striker 3, and of case 1 and detent 2.

A known delay mechanism, not shown, is located inside the striker 3 and engages with the inertia block 4. Other parts of the grenade, such as the priming cap which has to be struck by the striker pin and the explosive charge which the priming cap must detonate, are also not shown.

In the transport, i.e. safety, position shown in FIG. 1, the spring 10 opposes depression of the detent 2. The inertia block 4 is locked by the balls 5 which bear against the inner surface of case 1 and engage in recesses 4′. The striker 3 is also locked by the balls 6 which bear against the outer suruface of the lower portion of inertia block 4 and engage in recesses 2‴, thereby preventing movement of striker 3 relative to detent 2 under the action of spring 9. The balls 7 exert no locking effect, since their openings 2″ are aligned with both grooves 1′ and recesses 3″.

FIG. 2 shows a pre-armed position of the detonator, with the detent 2 depressed, i.e. with the grenade held in a users' hand in a manner such that, during a throwing movement, the detent 2 remains in a pushed in position under the effect of a pressure exerted by the index finger. In this position, recesses 4′ come to face an end part of grooves 1′ to free the balls 5 and thereby unlock the inertia block 4 which, under the action of the pressure exerted by the spring 8, remains in a pre-armed position, i.e. with its lower portion engaging in the bore of striker 3. The balls 7 bear against the inner face of case 1 and engage in recesses 3″ to complement the action of balls 6 tending to lock the striker 3 relative to detent 2.

If, for any reason whatsoever, the detent 2 is released before throwing, all of the componesnts automatically return to the initial position, i.e. the safety position, under the action of spring 10.

In the position shown in FIG. 3, while the detent 2 is still depressed, the inertia block 4 has moved, during an acceleration provided by imparting a throwing movement to the grenade, into an arming position under the

effect of inertia. In so doing, the delay mechanism (which has not been described in further detail) was actuated and the spring **8** compressed. The lower portion of the inertia block **4** is withdrawn from the bore of striker **3** to free the balls **6**, the balls **7** however continuing to maintain the striker **3** locked.

FIG. **4** represents the detonator during a first phase at the beginning of free flight, i.e. when the grenade is released. In this phase, the detent **2** returns to its initial position under the action of spring **10**. The balls **5** come to contact the inner surface of case **1** and lock the inertia block **4** in its end-of-path position, by engagement with a bevelled end of the upper portion of the inertia block **4**. Balls **6** remain in a non-locking position and balls **7** return to their original non-locking position in which the openings **2''** face grooves **1'**. In this position the striker **3** is therefore free to move downwardly under the action of spring **9**.

FIG. **5** shows second phase during free flight. In this position the striker **3** has moved downwardly relatively slowly over a part of its path under the action of the spring **9**, and under the control of the delay mechanism (not shown) which is unlocked.

FIG. **6** shows the third phase of the free flight in which the striker **3** has been moved by the spring **9** into its end-of-path position in which the striker causes detonation of the priming cap (not shown).

The described detonator has the following main advantages:

Arming takes place without a need to remove or loosen any special locking elements.

Arming only takes place after carrying out several actuating operations in a predetermined order.

In the event of a false manoeuvre, i.e. during an incorrectly effected throw, the entire mechanism is automatically replaced in the safety position.

What is claimed is:

1. A hand grenade detonator including spring-controlled means for actuating a striker, safety means for maintaining the striker actuating means in a pre-armed position and, in the absence of an acceleration resulting from a throwing movement, for automatically returning the striker actuating means to a safety position, and when this acceleration occurs, for moving the striker actuating means into an armed position, characterized by a spring-urged detent, a spring-urged inertia block reacting to the acceleration of throwing, means for automatically returning the detent to a safety position in the absence of an acceleration which moves the inertia block, and means for freeing the inertia block after production of the acceleration so as to move it from the pre-armed position to the armed position in a manner such that said striker actuating means moves the striker into a detonation position.

2. A detonator according to claim **1**, in which said means for automatically returning the detent to the safety position include balls and corresponding hollows as well as a spring.

3. A detonator according to claim **2**, in which said means for freeing the inertia block include balls and corresponding hollows as well as a spring.

4. A hand grenade detonator comprising a case, a manually operable detent movable relative to said case from a first position to a second position against the action of a spring, an inertia block movable relative to said detent from a safe position to an arming position against the action of a second spring, a striker movable relative to said detent from a safe position to a detonation position under the action of a third spring, means for locking said inertia block and said striker in their respective safe positions when said detent is in its first position and during movement of the detent from its first to its second position, means for locking said striker in its safe position when said detent is in its second position, means for freeing said inertia block for movement from its safe to its arming position against the action of said spring by inertia when the detonator is subjected to a throwing acceleration while said detent is in its second position, means for locking said inertia block in its arming position when said detent returns from its second to its first position by releasing it while said inertia block is held in its arming position by said throwing acceleration, and means for freeing said striker for movement from its safe to its detonation position when said detent returns to its first position with said inertia block locked in its arming position.

* * * * *