

UNITED STATES PATENT OFFICE

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POWDER TRAIN INTERRUPTER

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2 Claims. (Cl. 102-78)

1 This invention relates to an inertia-operated powder train interrupter for use in projectiles, and more particularly to a device wherein an explosion discharge passage remains blocked until the projectile has traveled a safe distance away from the gun, at which time a communicating passage is established between a squib and a booster charge.

One object of this invention is to provide a device for positively maintaining a passage connecting a squib and a booster charge in closed condition until the projectile containing the device is fired from a gun and the device is acted upon by setback. Upon firing of the projectile, after a delay which is interposed for purposes of safety, a connecting discharge passage is established between the squib and the booster charge, thus arming the device.

A further object of this invention is to provide a device of the character described which cannot be accidentally armed by dropping or jolting and which operates only after actuation by a sustained force of setback and substantial cessation of the force of setback.

A further object of this invention is to provide a device of the character described which is simple in operation and manufacture, and positive in action.

These and other objects of the invention will be apparent from the following description and the attached drawings in which:

Fig. 1 is a vertical sectional view of one form of the device showing the parts in their initial unarmed positions;

Fig. 2 is a vertical sectional view similar to Fig. 1 but taken in a plane at right angles thereto;

Fig. 3 is a cross-sectional view taken on lines 3-3 of Fig. 1;

Fig. 4 is a view similar to Fig. 1 but showing only a portion of the device with the parts in their immediate positions;

Fig. 5 is a view similar to Fig. 4 but with the parts in their final armed positions; and

Fig. 6 is a perspective view of most of the moving parts of the device in their initial positions.

In the drawings, the device comprises a cup-shaped lower base member 10 which is externally threaded at its lower end for mounting on other parts of the fuze. A passage 11 extends longitudinally through the closed end of the base

2 member, and near the upper end of the base member, its inner diameter is enlarged to form shoulder 12. A thin-walled cylindrical casing 13 is positioned on the upper end of base member 10. A support 14, having a cylindrical base portion 15, rests on shoulder 12 and is held in position by screw 15a, the upper portion of the support having a cross-section as shown in Fig. 3. Support 14 has a squib receiving cavity 16 in its lower portion which is connected by passage 17 to the lower surface of the support. Passage 17 is positioned so as to lie directly over the opening 11 in base member 10. The base 15 of the support has a longitudinal passage 18 extending therethrough. A shaft 19 extends upwardly from the center of base member 10 and is held in place by screw 20, the shaft projecting through the center of the lower portion 15 of the support and being held therein by a screw 21.

20 A cylindrical rotor 22 is rotatably mounted on shaft 19 in base member 10 and has a longitudinal passage 23 extending therethrough and so positioned as to connect passages 17 and 11 when the rotor is rotated to its armed position. A spring 24 mounted on shaft 19 is attached to a screw 25 on the bottom of support 15 and tends to rotate the rotor to a position in which the passages 17, 23 and 11 are aligned. The rotor also has a recess 26 in its upper surface.

30 On the upper surface of base 15 of the support is an inverted U-shaped guide 27 having an opening in its upper portion and attached by means of screws 28 and 28a to base 15. A pin 29 carrying a weight 30 extends upwardly a short distance through the opening in member 27 and extends downwardly through passage 18 in support 15 and into recess 26 in the upper surface of the rotor, thus holding the rotor against rotation. A spring 31 bearing against the weight 30 and the upper surface of support 15 tends to push pin 29 upwardly out of the recess 26 in the rotor.

Near the upper end of support 14, a shaft 32 is mounted so as to extend in a transverse direction into the space between the support and casing 13. Shaft 32 supports a member which comprises a cam 33 (Fig. 6) and a disc segment 34 which serves as an inertia element. Cam 33 and inertia element 34 may be formed as one piece or as several pieces keyed together, it being necessary that they rotate together. A spring 35 is

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attached at one end to a post 36 on support 14 and at its other end is keyed to the cam member 33, the spring tending to rotate inertia element 34 in a counterclockwise direction, as viewed in Fig. 1. Flanges 37 and 38 are located on the periphery of the element 34 and are separated by an opening 39. An inwardly extending shoulder 40 is formed on the lower end of flange 37.

A shaft 41 is mounted on support 14 below shaft 32 and has rotatably mounted thereon an inertia element 42 which is keyed to one end of a spring 43, the other end of which is attached to a post 44 on support 14. Spring 43 tends to rotate element 42 in a counterclockwise direction. A flange 45 extends inwardly toward support 14 from a portion of the periphery of element 42 so as to interlock at the proper time, as will be explained below, with flange 37 and shoulder 40 on member 34. A resilient latch 46 which extends upwardly adjacent member 42 is mounted on the upper surface of support 15 by means of screw 28a.

In operation, the parts of the device before acceleration are in the positions shown in Figs. 1 and 2. Due to the fact that the passage 23 in rotor 22 is not in alignment with passages 17 and 11, firing of the squib (not shown) in cavity 16 will not detonate the booster charge (not shown) to which passage 11 leads, and, therefore, the device is unarmed. The rotor 22 is retained in its unarmed position by pin 29 which extends into recess 26 in the rotor, the pin being held against upward movement out of opening 26 by cam 33 against which the upper end of the pin is urged by spring 31. The relative positions of the pin and the cam may be seen more clearly in Fig. 6. Inertia element 34 is urged in a counterclockwise direction by spring 35 but is unable to move in that direction, due to the fact that shoulder 40 of member 34 engages the end of flange 45 on member 42. Member 42 is at the limit of its counterclockwise rotation due to the fact that it abuts post 44, and its clockwise rotation is prevented by its flange 45 contacting flange 37 of member 34.

When the device is accelerated in the direction of the arrow in Fig. 1, due to firing a projectile containing it, elements 42 and 34 both tend to rotate in a clockwise direction under the actuation of the force of setback, but since member 42 is initially held against clockwise rotation by engagement of its flange 45 with the flange 37 of element 34, only inertia element 34 initially is able to rotate in a clockwise direction. As soon as element 34 rotates under the force of setback to the position in which it is shown in Fig. 4, wherein its rotation is halted by contact with post 36, opening 39 is positioned adjacent the end of flange 45 on element 42 so as to permit rotation of element 42 in a clockwise direction. As soon as element 42 is free to rotate in a clockwise direction, it moves to the chain line position shown in Fig. 4 so that for a short period of time while the acceleration continues, both elements 34 and 42 are at the limits of their clockwise rotation.

As soon as the acceleration decreases sufficiently, the spring 43 rotates member 42 in a counterclockwise direction, the rotation being halted by engagement of element 42 with a projection on the spring latch member 46 whereby member 42 is retained in the position shown in Fig. 5. Since flange 45 is no longer in the path of shoulder 40 of element 34, the latter is free to rotate in a counterclockwise direction as soon

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as the acceleration of the device ceases sufficiently for the spring 35 to rotate the element 34. The latter is thus rotated to the position shown in Fig. 5 where it is halted in its rotation by engagement with post 36.

Cam 33, which rotates with element 34, retains pin 29 in its blocking position until element 34 reaches the position shown in Fig. 5, at which time the cam has rotated out of the way of the upper end of pin 29, and spring 31 then pushes the pin upwardly out of the opening 26 in rotor 22, thus allowing spring 24 to rotate the rotor to the position wherein openings 17, 23 and 11 are aligned and the device is armed. The armed position of rotor 22 may be defined by detents or other suitable means.

During the acceleration of the device, the weight 30 on pin 29 is forced downwardly by the force of setback, thus moving pin 29 downwardly away from cam 33 so as to prevent friction between the upper end of the pin and cam 33 when the latter rotates with element 34. This downward movement of pin 29 also doubly assures that it will retain the rotor 22 against rotation during acceleration of the device.

Due to the interlocking arrangement involving the flanges on the inertia elements 42 and 34, the device is safe against unsustained accelerations caused by dropping or jolting, and such minor accelerations will not have a cumulative effect due to the fact that spring 35 will return element 34 to its initial position after the unsustained acceleration is terminated. In order to arm the device, the acceleration must be powerful and sustained, for it must move element 34 to its position shown in Fig. 4 and must continue long enough thereafter to move element 42 to its position shown in Fig. 4.

I claim:

1. In an inertia-operated arming device, an element rotatable from an unarmed to an armed position and having an explosion discharge passage, said passage being inoperative when said element is in its unarmed position, biasing means tending to cause rotation of said element to its armed position, a pin normally engaging said rotatable element to retain said element in its unarmed position, biasing means tending to move said pin out of engagement with said rotatable element, a cam normally retaining said pin in engagement with said rotatable element, biasing means tending to move said cam for disengagement of the pin from said rotatable element, means for holding said cam in engagement with said pin comprising a flanged inertia element movable with said cam, and a second inertia element having a flange adapted to engage a flange of said first inertia element, sustained acceleration of the device and substantial cessation of said acceleration causing movement of said cam for disengagement of said pin from said rotating element, whereby said rotating element is free to move to its armed position.

2. In an inertia-operated arming device which is normally unarmed, a support, a first spring biased inertia mass pivoted to said support for controlling the arming of said device and carrying a first circumferential flange section with a radially inward projection at one end, a second spring biased inertia mass pivoted to said support at a point spaced from said first mass and carrying a second circumferential flange section, said projection on said first flange co-acting with said second flange to maintain said masses in normal unarmed position, said first and second flanges

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co-acting upon setback to allow said first mass to rotate before said second mass, and said spring bias for said first mass operative after rotation of said second mass to reverse rotation of said first mass to a position permitting arming of said device.

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