March 4, 1969 A. LOSFELD 3,430,567

COMBINATION FUZE FOR EXPLOSIVE DEVICES

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Fig. 1

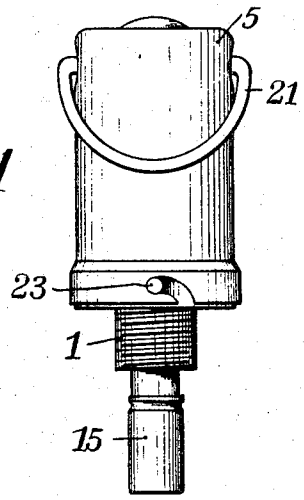


Fig. 2

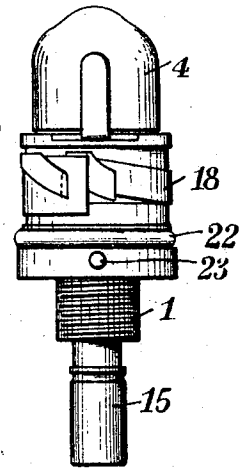


Fig. 5

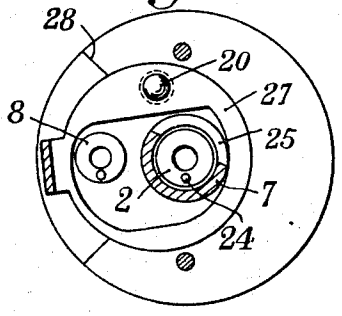


Fig. 6

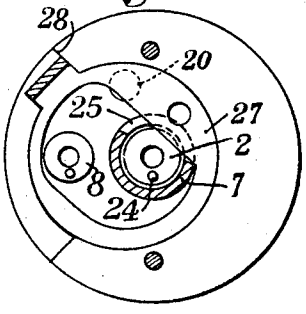


Fig. 3

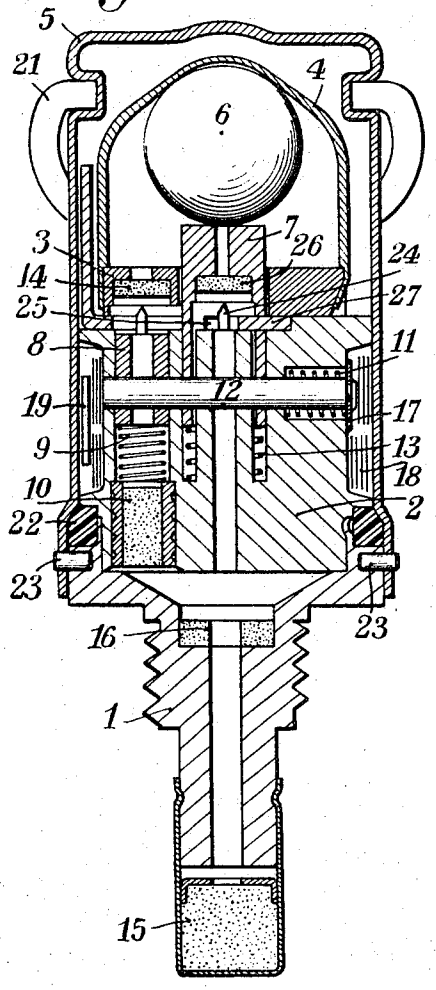
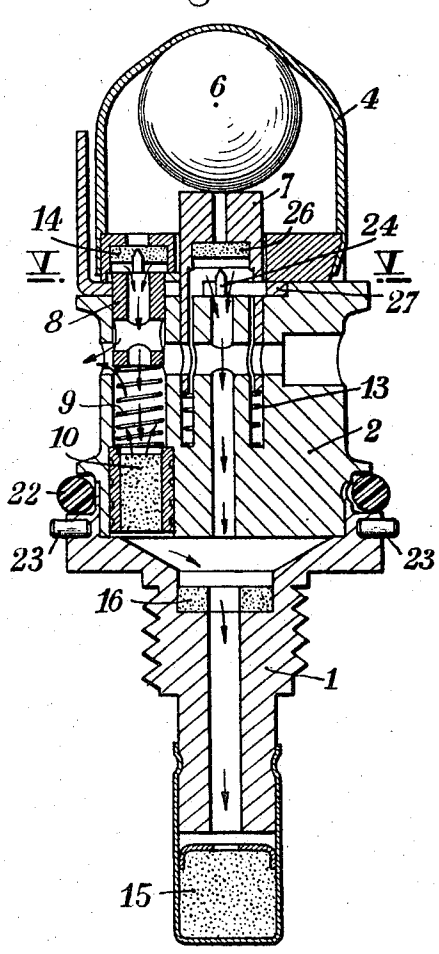

5
21
4
6
7
26
24
3
14
25
27
8
11
12
19
17
9
13
18
10
2
22
23
23
16
1
15

Fig. 4


6
4
7
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14
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V
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Fig. 7

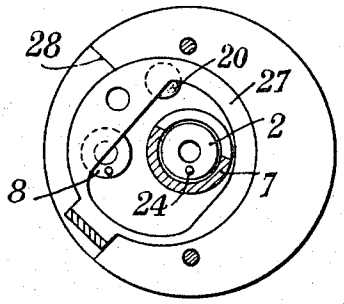


Fig. 8

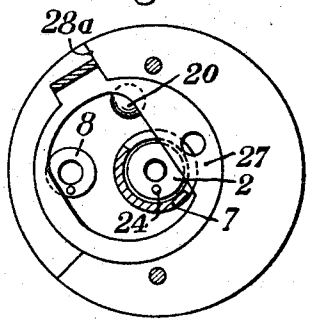


Fig. 9

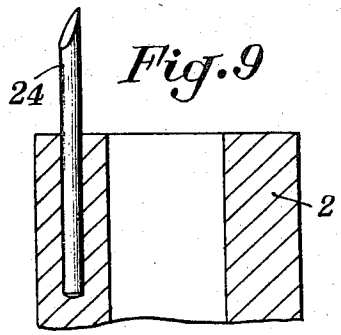


Fig. 10

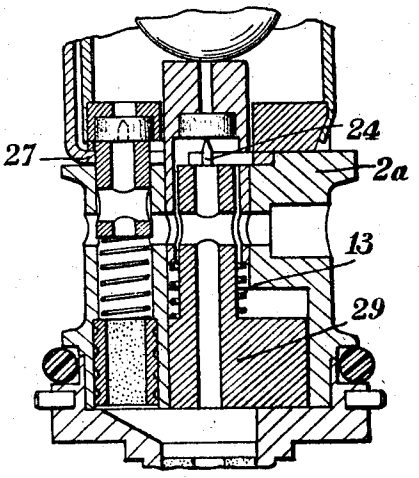
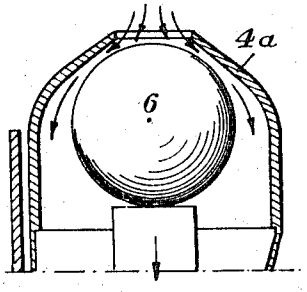


Fig. 11



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COMBINATION FUZE FOR EXPLOSIVE DEVICES

André Losfeld, 13 Rue Thiebault, 94, Charenton, France

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U.S. Cl. 102—72 6 Claims
Int. Cl. F42c 9/10

ABSTRACT OF THE DISCLOSURE

Combination fuze, of simple and inexpensive construction, notable for rifle- and hand-grenades, secured with a single straight arming pin, and provided with a selector to control the explosive device to function at will either on impact-delay, or on impact only, or on delay only, said selector consisting of a flat cut-out rotatable disc housed in a recess in the upper section of the fuze.

This invention relates in general to fuzes and has specific reference to combination fuzes for rifle and hand grenades, or any other devices requiring a fuze for their excitation.

The fuze according to this invention is simple to manufacture and of relatively moderate cost, and can be readily fitted to grenades also of low cost type such as thermoplastic grenades with an external metal tube internally prefragmented and fitted with a screw type fastening affording a simple means of assembly onto the thermoplastic device.

In a prior French Patent No. 1,429,344 filed by the same applicant, a fuze for explosive devices has already been proposed, notably for grenades, with which the explosive device can be operated as an impact or delay device; this fuze being provided with a selector to be set after removal of the fuze cover and before projecting the device to permit the operation of one or other of the two mechanisms (impact or delay). To this end, the two aforesaid mechanisms are locked by separate arming pins spring-loaded in the ejection direction, and retained in this locked condition by a wound tape adapted to unwind itself after removal of the fuze cover and during the initial part of the trajectory of the device. The selector consists of a rotatable cylindrical sleeve mounted on the body and formed with apertures in an intermediate angular portion of the sleeve, adapted to free the ejection passage of both arming pins, and in two other lateral angular positions adapted to free the ejection passage of only one of the arming pins.

The fuzes so designed are rather costly to manufacture owing to the complicated construction resulting from the use of two arming pins disposed transversely in the body. Moreover, the greater part of the rotating selector sleeve mounted about the body is more or less covered by the wound tape after the removal of the fuze cover, and further, the positioning of this sleeve in the angular setting corresponding to the desired mode of operation is impaired by frictional contact with the wound tape and may thereby cause a premature and undesired unwinding thereof.

It is the object of the present invention to provide a fuze of the general type set forth hereinabove, which is both simple to manufacture and moderate in cost, and

which is provided with a selector easy to set and free of any objectionable contact with the wound tape.

To this end, the fuze has a single straight arming pin adapted to hold both the impact system and the delay system against activation, and the release both mechanisms during its ejection (after the wound tape has been unwound), and the selector consists of a flat rotatable disc mounted in a circular recess formed in the upper section of the assembly, adapted to be rotated by means of a radial lug or control arm bent upward externally of the protective cap. This disc has an aperture of which the inner contour is so designed that in a mean setting of the control arm, it permits the free operation of both impact and delay mechanisms, and in another position of the control arm which is offset to one or the other side with respect to the mean position, it will lock one or the other said mechanisms.

The features and advantages of this invention will appear more completely from the following description given by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 illustrates the fuze closed by the fuze cover;

FIGURE 2 shows the fuze after removal of the fuze cover;

FIGURE 3 is an axial section view of the fuze in its normal or storage condition, the section being taken along a plane containing the axes of the fuze and of the arming pin;

FIGURE 4 is a similar section showing the fuze during the initial phase of the trajectory of a device fitted with the fuze, after the tape has been unwound and the arming pin ejected;

FIGURE 5 is a cross section taken along the line V—V of FIGURE 4, to show the upper section of the cylinder and the manner in which the selector disc interacts with the impact mechanism and the delay mechanism, with a selector setting corresponding to the function of both impact and delay systems;

FIGURE 6 shows in a like manner the selector in the delay only operating position;

FIGURE 7 shows in a like manner the selector in the impact only operating position;

FIGURE 8 shows in a like manner a form of the upper section of the cylinder with the selector in a safety position in which it simultaneously locks the impact mechanism and the delay mechanism;

FIGURE 9 shows on a large scale a specific form of the embodiment of the impact and delay striker pin assemblies;

FIGURE 10 shows a modified construction of the impact mechanism aiming at improving the reliability of operation of this mechanism in case of the protective cap withstanding frontal impact.

FIGURE 11 shows a modified construction of the protective cap also aiming at increasing the reliability of operation of the impact system in the event of frontal impact.

To facilitate assembly and reduce costs, the fuze consists of stacked elements mounted on a base **1** having a detonator **15** or any other fire transmitting device crimped thereon and carrying therein a fire relay **16** serving the purpose of prolonging the fire from the two operating systems to the detonator **15**. A sliding piston **7** is mounted coaxially within a cylinder **2**, carries an impact primer **26** and is forced by a spacer spring **13** against a ball **6**

which in turn is forced against the protective cap 4. The upper face of the piston 7 which presses against the ball 6 may be either flat, as shown in the drawing, or tapered, or of any other suitable shape adapted to transmit an axial thrust to the piston when the ball 6 in the protective cap 4 is shaken or moved by the jar of impact of a device fitted with the fuze. This arrangement constitutes the impact system.

The delay system is offset from the axis of the cylinder 2, and consists of the delay primer 14 fitted into a recess formed in the plate 3 mounted on the top face of cylinder 2 and a firing pin assembly 8 under tension of a spring 9 seated on the metal sheath containing the combustible delay composition, 10.

Both systems are held against activation by a straight arming pin 12 carrying a release washer 17 at one end; this washer being held under tension by an ejector spring 11. The pin 12 may have any desired and suitable cross-sectional contour, and is retained in the cylinder 2 against the tension of spring 11 by a wound tape 18 carrying at its outer end a lead weight 19 for facilitating the unwinding thereof. The weight may be replaced by a spoon or any other safety device.

A rotatable selector 27 is mounted between the cylinder 2 and the plate 3, and is held in the mean position corresponding to the functioning of both firing systems (impact/delay) by means of a lock ball 20. A fuze cover 5 provided with a pull-off ring 21 seals the fuze at the annular gasket 22. This cover 5, in the form of embodiment illustrated in the drawing is held down by a bayonet mounting comprising the radial pins 23, but it may also be secured to the base 1 by screwing, or by crimped notches, or through any other suitable quickly detachable arrangement.

The fuze operates as follows:

After the fuze cover 5 has been removed (FIGURE 4), the selector 27 which is easily operated by means of its lug projecting from the protective cap 4, can be set in one or the other direction around the protective cap to select any one of the following three modes of operation:

(1) Impact/delay
(2) Impact
(3) Delay

(1) To obtain the impact/delay operation, the selector is left in its mean setting (FIGURE 5) in which it is normally held by the lock ball 20. Both systems are free with respect to each other. When the tape 18 has unwound completely, the arming pin 12 is ejected by spring 11 releasing both systems. The delay firing pin 8 is snapped by the spring 9 against the primar 14 as shown in FIGURE 4, thus igniting the combustible delay composition 10 which, at the end of its combustion time, transmits the fire to the relay 16 which carries the fire to the detonator 15. If impact occurs before the complete combustion of the delay composition (irrespective of the angle of impact), the ball 6 will move within the protective cap 4 and produce an axial movement of piston 7, the latter thus causing the impact primer 26 to hit the firing pin 24; in this case fire is propagated through the axial passage of cylinder 2, and transmitted to the relay 16 so as to ignite the detonator 15. In the form of embodiment illustrated in FIGURES 3 and 4, the firing pin 24 is fixed, the protective cap being sufficiently deformable to cause the operation of the impact mechanism in the case of head-on impact. If the protective cap is resistant to deformation, the reliability of function is provided for by one of the modified forms of embodiment illustrated in FIGURES 10 and 11. In the alternate construction shown in FIGURE 10, the firing pin assembly 24 is mounted on a movable piston 29 formed with a lower shoulder engaged by the spacer spring 13. This piston 29 should be advantageously weighted to have a momentum sufficient for effective functioning under operating conditions. Under these conditions the above-mentioned shoulder will preferably have a greater diameter than the axial passage containing the spring 13, the piston bore in cylinder 2A being shaped accordingly. In the alternate form of embodiment illustrated in FIGURE 11, the protective cap 4*a* has a circular aperture in its upper section, and in this case the system operates by reverse-thrust.

(2) The selector 27 moved to the position shown in FIGURE 7 prevents the firing pin assembly 8 of the delay system, after release by the arming pin 12, from igniting the primer 14, so that activation can only take place by impact since the impact mechanism is free to transmit thrust exerted by the ball 6.

(3) In the position shown in FIGURE 6, the selector 27, now rotated in the opposite sense, engages a groove 25 formed in the piston 7 to prevent the piston moving in the case of impact, whilst the delay system is now free to transmit fire from primer 14 to detonator 15.

The shoulder 28 limiting the movement of selector 27 in the direction causing delay operation as shown in FIGURE 6 is transferred to the position 28*a* in the modified construction illustrated in FIGURE 8. By moving the selector against this shoulder 28*a* the selector is set in a position of safety in which both firing systems are locked.

The firing pin assemblies may be mounted in a simple and economical manner as shown for example in the case of the firing pin assembly of the impact mechanism in FIGURE 9. A blind hole, in which a steel pin is driven like a nail, is formed in the annular face surrounding the axial fire passage of the firing pin support member. The end of the projecting portion of the steel pin is then cut obliquely by means of suitable shears to give a sharp point.

In case of accident during storage of explosive devices fitted with the fuze described in this invention, such as a violent shock against the head, the arming pin 12 constitutes an efficient fire protection barrier; ignited gas from the primers being allowed to dissipate through the passages formed between the cylinder 2 and the plate 3, and by the aperture in the selector disc 27.

What I claim is:

1. A combination fuze for explosive devices, notably for grenades, comprising a detonator, two independent, isolated systems, disposed side by side in a fixed position, the impact system and the delay system, a primar in each of said systems, a selector which can be set prior to projecting the device for determining at will the mode of operation of the fuze, said selector consisting of a flat part moving in a plane substantially perpendicular to the axes of said systems, said part being shaped in such a way that its positioning liberates the mechanism of the impact system, or of the delay system, or of both systems together, and a single straight arming pin to block all mechanisms of said systems and to close all accesses between the primers and the detonator.

2. A fuze as set forth in claim 1, wherein said selector consists of a cut-out disc having on its outside periphery a radial control-lug, said control-lug, when in a first setting, positions said disc in such a way that its inner contour leaves free both the impact system and the delay system, when in a second or a third setting, positions said disc in such a way that its inner contour locks either the impact system or the delay system, and when in a fourth setting, positions said disc in such a way that its inner contour locks both systems.

3. A fuze as set forth in claim 1, wherein the axis of each component of each said independent system coincides with the axis of that system, and wherein the axes of the two systems are parallel.

4. A fuze as set forth in claim 1, wherein the independent delay system comprises a primer, a firing pin assembly, a spring, a combustive delay, all these components being on a common axis substantially parallel to the axis of the impact system, the mechanism of said delay system being intersected by that section of the arming pin which leaves the fuze last.

5. A combination fuze for explosive devices comprising, a body, a detonator, two independent, isolated systems, disposed side by side in a fixed position comprising an impact system and a delay system, a primer in each of said systems, a selector operable prior to projecting the explosive device for determining the mode of operation of the fuze, said selector consisting of a flat part moving in a plane substantially perpendicular to the axes of said systems, said part being shaped so that its positioning liberates the mechanism of the impact system, or of the delay system, or of both systems together, a single straight arming pin to releasably lock all mechanisms of said systems and to close all accesses between the primers and the detonator, said body comprising a base, a cylinder, a plate and a protective cap, and said base, cylinder, plate and protective cap being superposed disposed one upon the other.

6. A combination fuze according to claim 5, in which said plate comprises passages providing communication between said primers and the interior of said protective cap.

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BENJAMIN A. BORCHELT, *Primary Examiner.*

GERALD H. GLANZMAN, *Assistant Examiner.*