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FUSE FOR HAND GRENADES AND PROJECTILES

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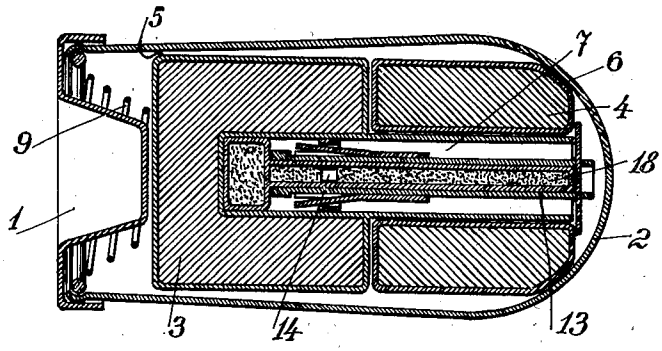


Fig. 1

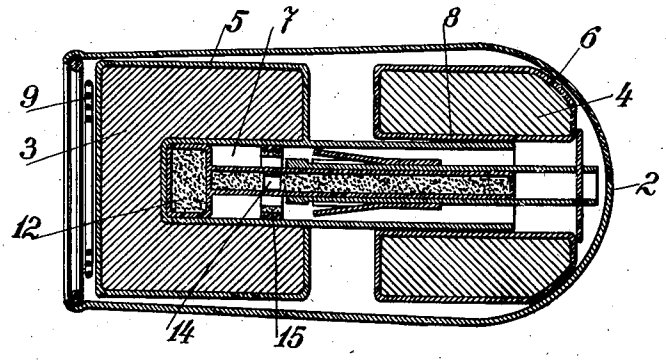


Fig. 2

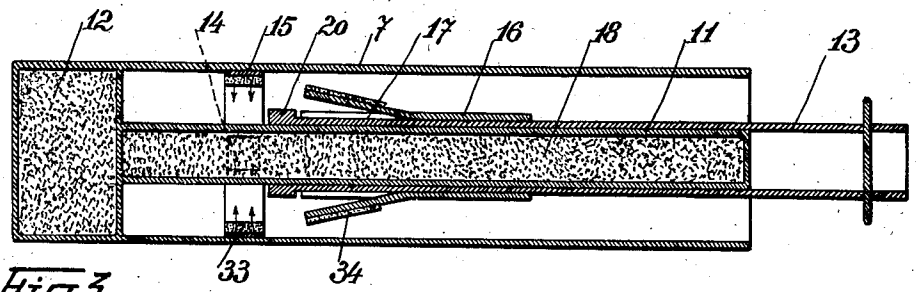


Fig. 3

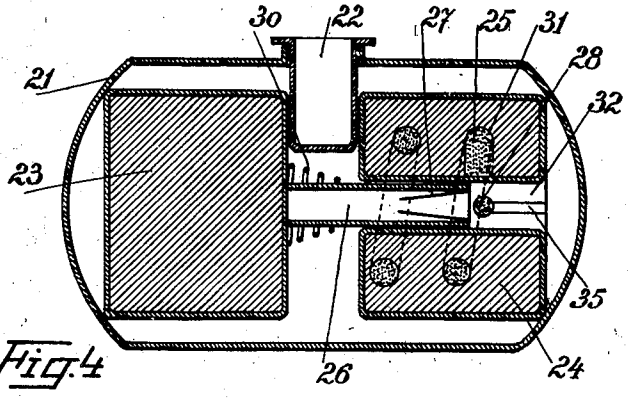


Fig. 4

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FUSE FOR HAND GRENADES AND PROJECTILES

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21 Claims. (Cl. 102—39)

The present invention relates to improvements in fuses for enabling hand grenades and projectiles to be made "live" in flight.

To this end the present invention deals with a fuse which is so constructed and arranged that the fuse composition, when the grenade is discharged or thrown is ignited by means of an igniting device, burns slowly and uniformly, but is caused to explode on impact and thereby directly or indirectly causes the bursting charge of the grenade to explode.

Combustible or explosive matter, suitable for this purpose is known, as for example, the smokeless or the black gun-powder, which burns slowly at normal pressure, but explodes at excess pressure.

The essential features of a fuse according to the present invention is a passage or tube filled with a fuse composition having the above properties, means for igniting such slow burning composition when the projectile is discharged or thrown, i. e., when in flight, and means which closes off the passage or tube at a given moment whereupon the charge of slow burning composition explodes. In order to ignite such charge, suitable ignition means are provided and these are controlled by forces of inertia in such a way that the individual parts of the fuse, which come into operation as a result of relative displacement, are arranged on two bodies, which are so mounted and yieldingly supported as to be displaceable towards and from one another in the fuse.

The relative movement of these members takes place when the projectile is discharged or thrown, i. e., in flight whereby they then ignite the abovementioned slow burning charge. Thereafter the passage or tube containing this charge must remain open until the projectile has to explode. For the purpose of exploding, the passage or tube has to be closed. The means for opening or closing the passage or tube are controlled by forces of inertia and spring forces. For this purpose, for instance, the centrifugal force which occurs during the turning or overturning of the projectile can be utilized to keep open during the flight of the projectile those members by which the passage or tube is normally closed. When the centrifugal force, e. g., on the impact of the projectile, ceases to be operative, such closing members of the opening of the passage or tube containing the fuse composition are spring actuated to close the passage or tube, whereupon the fuse composition explodes forthwith. The fuse can, however, also be so constructed that the ignition members both on discharge and impact, are operated by forces of inertia working in a straight line, the passage or tube containing the slow burning fuse composition being kept open during the flight of the projectile by means of a spring at the end of the flight, the closing of the passage or tube is effected as a result of the forces of inertia also becoming effective on impact.

In the accompanying drawing in which are shown two of various possible examples of my invention:—

Fig. 1 is a section through a hand grenade fitted with a fuse according to my invention, the grenade being shown in the inactive condition.

Fig. 2 is a section through the grenade according to Fig. 1 in its active or "live" condition after being thrown, i. e., in flight.

Fig. 3 is an enlarged section through the fuse of the grenade according to Figs. 1 and 2.

Fig. 4 is a sectional view of a modified construction.

Those parts of the grenade which are unnecessary for the comprehension of the invention are not illustrated in the drawing.

The bursting charge provided in the housing 2 that is closed off by a cap 1, is divided into two parts 3 and 4, in such a way that the centres of gravity of these parts are situated on opposite sides of the axis round which the grenade revolves when in flight, e. g., after throwing. In the envelopes 5 and 6 of the explosive charge, co-axial bores 7 and 8 are provided, while the body 3 is yieldingly supported by the spring 9 and the body 4 is pressed against the end wall of the housing 2. In the bores, 7, 8 is the fuse device according to my invention. This in the constructional example illustrated, consists of two telescopic parts, which are shown in longitudinal section, on an enlarged scale in Fig. 3 in a position where they are partly drawn out.

The tube 11 is closed at each end and on the left-hand end is connected with the percussion cap 12. The bore 18 of the tube 11 is filled with a fuse composition which burns slowly under normal pressure, but explodes with an increase of pressure. As shown the tube 11 is displaceable in the tube 13. The tube 13 is, at its right-hand end, made fast with the explosive body 4, according to Fig. 1, and is so long that in the inactive condition of the fuse (Fig. 1) it covers openings 14 provided in the wall of the inner tube 11, but exposes these openings when the two tubes are drawn somewhat apart, as shown

in Figs. 2 and 3. Level with or encircling the openings 14, a ring 15 is fixed in the tube 7 which is connected with the percussion cap 12. The interior of the ring is provided with a known igniting composition, e. g., a friction composition 33. Slidable freely on tube 13 is a sleeve 16 with outwardly bent spring fingers 17, having friction surfaces for working over and igniting the friction composition 33. In the starting position, these fingers 17 lie within the ring 15 (Fig. 1). The tube 7 is fixed in the explosive body 5.

If the grenade is so thrown that it turns over end for end in the course of its flight and the cap 1 has been removed beforehand, then the centrifuging of the body 3 causes the spring 9 (Fig. 2) to be compressed, whereby the tube 11 is drawn partly out of the tube 13 while the headed end 20 on tube 13 holds the sleeve 16 in position thereon. The inner side of ring 15, provided with the friction composition 33, is rubbed along the friction fingers 17, the friction composition 33 ignites and burns continuously round the inner periphery of the ring 15. Immediately the left-hand end of the tube 13 has exposed the openings 14, the burning composition 33 ignites—through the openings 14—the fuse composition in the tube 11. So long as the openings 14 are not closed, that is to say, so long as the centrifugal force keeps the body 3 in the position shown in Fig. 2, the fuse composition in the bore 18 burns slowly and uniformly. If the centrifugal force is lacking, e. g. because the grenade has been arrested or checked then the spring 9 again pushes the body 3 to the right, up to body 4 (Fig. 4). The left end of the tube 13 closes the openings 14, whereupon as a result of the increase in pressure in the bore 18, the fuse composition explodes instantaneously and through the percussion cap 12 also causes the explosive bodies 3 and 4 to explode.

The points where the two friction parts 17 ignite the burning composition 33 are angularly displaced with respect to the ignition openings 14 by 90°. Consequently a certain time must elapse before the flame developed on the ring 15 appears in front of the openings 14. The fuse therefore operates with a certain delay action in such an angularly displaced arrangement of the openings 14.

If the fuse composition of bore 18 burns out before the closing of the openings 14, the grenade can no longer explode. Therefore, if for any reason the centrifugal force is lacking after the grenade is thrown, or the bodies 3 and 4 get fixed, i. e. do not return to the position according to Fig. 1, or if the spring 9 breaks, or if there is some other cause why the bodies 3 and 4 should not resume their position in Fig. 1, then the fuse column 18 burns out and the fuse cannot operate any longer. If the igniting means 15 and 17 do not cause the composition to be ignited when the fuse is thrown, ignition cannot take place after the recession of the bodies 3 and 4 the one from the other, because the springy friction fingers 17 open, after the drawing apart of the tubes 11 and 13, to such a radial extent (Fig. 3) that the fingers 17, when the tubes 11 and 13 are telescoped, strike against the ring 15, so that the friction fingers and the friction composition can no longer come into contact. If the tubes 11 and 13 are telescoped, the ring 15 pushes the sleeve 16 along the tube 13 to the right. However, in this case, if the fingers 17 were to slide into the ring, so that the friction composition 33 ignites, even then the grenade could not explode, because the headed end 20 has covered the openings 14 before ignition of the fuse composition can have taken place through the burning of the friction composition.

The fuse is safe if dropped because bodies 3 and 4 are guided co-axially and no outer force can cause a relative displacement between these bodies when simply falling.

Fig. 4 shows a construction intended for projectiles, wherein the relative movements of the parts of the fuse are effected by forces of inertia operating in a straight line. The explosive bodies 23 and 24 fitted in the housing are retained in the position shown, even after removal of the safety device 22. On the body 23 the tube 26 is fitted, in whose interior spring friction fingers 27 are provided. The head mass 28 is arranged on a carrier 35 fixed on the body 24. In the body 24 is a bore 32, into which the tube 26 projects. In the body 27 there is further a spiral passage or tube 25, which is filled with a similar fuse composition as the bore 18 of the first construction.

Prior to firing, the safety device 22 is removed. At the moment of shooting, the bodies 23 and 24 approach one another, the explosive body lying in front in the direction of shooting lagging on account of its inertia and the spring 30 being compressed. The friction fingers 27 rub over the friction composition 28 and ignite the same. During the flight of the projectile, the spring 30 again presses the explosive bodies 23 and 24 away from one another, so that the flame of the burning composition 28 ignites, through the opening 31, the fuse composition in the helical passage 25.

On graze or impact, the bodies 23 and 24 again approach one another, so that the opening 31 of the channel 25 is closed by the tube 26, whereupon the fuse composition explodes and ignites the explosive bodies 23, 24.

The shape of the passage or tube containing the fuse composition can be varied and it is unimportant whether the ignition of the fuse composition is effected through one or more holes of the passage or tube. The number of the explosive bodies capable of being displaced towards and away from one another can also be more than two, and it does not matter which of these bodies is displaced relatively to the others under the influence of centrifugal force or the force of inertia. The parts of the fuse capable of being displaced towards and away from one another need not be fixed on the explosion bodies. Also other bodies can serve as carriers for these parts.

What I claim is:—

1. Fuse for an explosive missile comprising a container, a fuse composition in such container capable of burning slowly under normal pressure but of exploding under excess pressure, said container having openings therein to permit the fuse composition, when ignited, to burn under normal pressure, means for covering said opening, said means and said container being relatively movable in flight of the missile to uncover said openings, means movable in flight of the missile to ignite the fuse composition, means to set back said opening covering means on impact, or after a time interval, to cover said openings to subject said previously slowly burning fuse composition to excess pressure and cause it to explode and in turn cause the missile to explode.

2. Fuse for hand grenades and projectiles, comprising a container, fuse composition in said container, said container having openings therein, a shutter slide displaceable relatively to these open-

ings, a carrier for each of said container and said slide, a common housing for said carriers, said carriers being yieldingly supported and relatively displaceable in said common housing, and means for igniting the fuse composition through said openings.

3. Fuse for an explosive missile comprising a container, a fuse composition in such container capable of burning slowly under normal pressure but of exploding under excess pressure, said container having openings therein to permit the fuse composition when ignited, to burn under normal pressure, means for covering said openings, said means and said container being relatively movable by centrifugal force in flight of the missile to uncover said openings, means movable in flight of the missile to ignite the fuse composition, means to set back said opening covering means on impact, or after a time interval, to cover said openings to subject said previously slowly burning fuse composition to excess pressure and cause it to explode and in turn cause the missile to explode.

4. Fuse for an explosive missile comprising a container, a fuse composition in such container capable of burning slowly under normal pressure but of exploding under excess pressure, said container having openings therein to permit the fuse composition when ignited, to burn under normal pressure, means to cover said opening, spring means, said covering means being relatively movable against said spring means in flight of the missile to uncover said openings, means movable in flight of the missile to ignite the fuse composition, means to set back said opening covering means on impact, or after a time interval, to cover said openings to subject said previously slowly burning fuse composition to excess pressure and cause it to explode and in turn cause the missile to explode.

5. Fuse for hand grenades and projectiles, comprising a container, fuse composition therein, openings in the wall of said container, a shutter slide displaceable relatively to these openings, a carrier for each of said container and said slide, a common housing for said carriers, said carriers being mounted so as to be relatively displaceable in said common housing, a spring for pressing said carriers against one another, and means for igniting the fuse composition through said openings.

6. Fuse for hand grenades and projectiles comprising a container, fuse composition therein, openings in the wall of the container, a shutter slide displaceable relatively to these openings, a carrier for each of said container and said slide, a common housing for said carriers, said carriers being mounted so as to be relatively displaceable in said common housing, a spring for pressing said carriers away from one another, and means for igniting the fuse composition through said openings.

7. Fuse for hand grenades and projectiles, comprising a container, priming composition therein, openings in the wall of said container, a slide for opening and closing said openings, a carrier for each said container and said slide, a housing in which said carriers are yieldingly supported so as to be relatively displaceable, friction composition for the ignition of the priming composition arranged in the general plane of said openings, and means for igniting the friction composition by friction controlled by said slide.

8. Fuse for hand grenades and projectiles, comprising a container, priming composition therein, openings in the wall of said container, a slide for opening and closing said openings, a carrier for each said container and said slide, a housing in which said carriers are yieldingly supported so as to be relatively displaceable, igniting means for the ignition of the priming composition encircling said openings, a friction body displaceably arranged on said slide and a stop on the slide for entraining the friction body therewith during the opening movement thereof.

9. Fuse for hand grenades and projectiles, comprising a container, fuse composition therein, gas releasing openings in the wall of said container, a slide for opening and closing said openings, a carrier for each said container and said slide, a housing in which said carriers are yieldingly supported so as to be relatively displaceable, an ignition body for the ignition of the fuse composition arranged opposite the openings of said container and a friction member displaceably arranged on the shutter slide whereby the shutter slide and the friction member are so arranged relatively to one another that the closing up of said gas releasing openings takes place before the co-operating friction igniting components come into contact.

10. Fuse for hand grenades and projectiles, comprising two spring-supported carrying bodies, a housing in which said bodies are mounted so as to be displaceable towards and away from one another, a tubular container containing priming-composition carried by one of said carrying bodies, and a tubular slide co-axial with the priming composition container carried by the other carrying body, the priming composition container being slidable in said slide, openings, controlled by the slide, in the priming composition container, an ignition body arranged opposite said openings in fixed relation therewith, and friction means, controlled by the slide, for firing the ignition body.

11. Fuse for hand grenades and projectiles, comprising two spring supported carrying bodies, a housing in which said bodies are mounted so as to be displaceable towards and away from one another, a tubular container containing the priming composition carried by one carrying body, a tubular slide co-axial with the priming composition carrier carried by the other carrying body, said container and said slide being capable of sliding on one another, openings, controlled by the slide, in the priming composition container, an ignition body arranged opposite said openings in fixed relation therewith, friction means, and a stop on said slide, and friction means being controlled on one side by said stop and arranged to slide on said slide, for the ignition of the ignition body.

12. Fuse for hand grenades and projectiles, consisting of two spring supported carrying bodies, a housing in which said bodies are mounted so as to be displaceable towards and away from one another, a tubular container containing the priming composition carried by one carrying body and a tubular slide co-axial with said container carried by the other carrying body, the priming-matter carrier being slidable in said slide, openings, controlled by the slide, in the priming composition container, an ignition body arranged opposite these openings in fixed relation therewith, a sleeve, and a stop on said slide, said sleeve being controlled on one side by said stop and slidably mounted on the slide, and spring fingers on said sleeve carrying friction means for igniting the ignition body.

13. Fuse for hand grenades and projectiles,

comprising two spring-supported carrying bodies, a housing in which said bodies are mounted in tandem so as to be displaceable towards and away from one another, a tubular container containing priming-matter carried by one of said bodies, and a tubular slide co-axial with the priming-matter container carried by the other of said bodies, in which slide the priming-matter carrier slides, openings, controlled by the slide, in the priming-matter container, a ring fixed opposite said openings and co-axial with the priming-matter container, an ignition mass carried by said ring for igniting the priming-matter, said ring encircling the priming-matter container with clearance for the passage of said slide and friction means on said slide for igniting the ring-shaped ignition body.

14. Fuse for hand grenades and projectiles, comprising two spring-supported carrying bodies, a housing in which said bodies are displaceably mounted opposite one another, a tubular container containing priming-matter carried by one said body, and a tubular slide co-axial with the priming-matter container carried by the other said body, the priming-matter carrier being slidable in said slide, openings, controlled by the slide, in the priming-matter container, a ring fixed opposite said openings and co-axial with the priming-matter container, an ignition mass carried by said ring for igniting the priming-matter, a sleeve slidably mounted on said slide, spring fingers on said sleeve carrying friction means for igniting the ignition body, said friction fingers being angularly displaced with respect to said openings.

15. Fuse for hand grenades and projectiles, comprising a container, priming-matter therein, openings in the wall of said container, a shutter slide displaceable relatively to these openings, a carrying body for each said container and said slide, a common housing in which said carrying bodies are so mounted as to be relatively displaceable coaxially, a spring arranged between the housing and one carrying body for pressing said bodies towards one another, and ignition organs for the ignition of the priming-matter, said organs, the shutter slide and said priming-matter container being arranged in the interior of the two carrying bodies.

16. Fuse for hand grenades and projectiles, comprising a container, priming-matter therein, openings in the wall of said container, a shutter slide displaceable relatively to these openings, a carrying body for each said container and said slide, a common housing in which said carrying bodies are so mounted as to be relatively displaceable coaxially, a spring arranged between said two carrying bodies for pressing said bodies against the wall of the common housing, ignition organs for the ignition of the priming-matter, said priming-matter container, the shutter slide and said organs being arranged in the interior of the two carrying bodies.

17. Fuse as in claim 1, having centrifugal means whereby in flight to uncover said openings and ignite the means which in turn ignites the fuse composition.

18. Fuse as in claim 1, having centrifugal means whereby in flight to uncover said openings and ignite the means which in turn ignites the fuse composition, and having spring means whereby to re-cover said openings on graze or impact or after a time interval.

19. Fuse as in claim 1, having means operatable by inertia in flight to ignite the means which in turn ignites the fuse composition.

20. Fuse as in claim 1, having means operatable by inertia in flight to ignite the means which in turn ignites the fuse composition, and having spring means to uncover said openings in flight and permit the fuse composition igniting means to set fire thereto.

21. Fuse for an explosive missile, comprising a container, a fuse composition in such container capable of burning slowly under normal pressure but of exploding under excess pressure, said container having an opening therein to permit the fuse composition, when ignited, to burn under normal pressure, means for covering said opening, said means acting to keep said opening uncovered in flight of the missile, means movable in the flight of the missile to ignite the fuse composition, said covering means being arranged to cover said opening on impact, or after a time interval, to subject said previously slowly burning fuse composition to excess pressure and cause it to explode and in turn cause the missile to explode.

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