

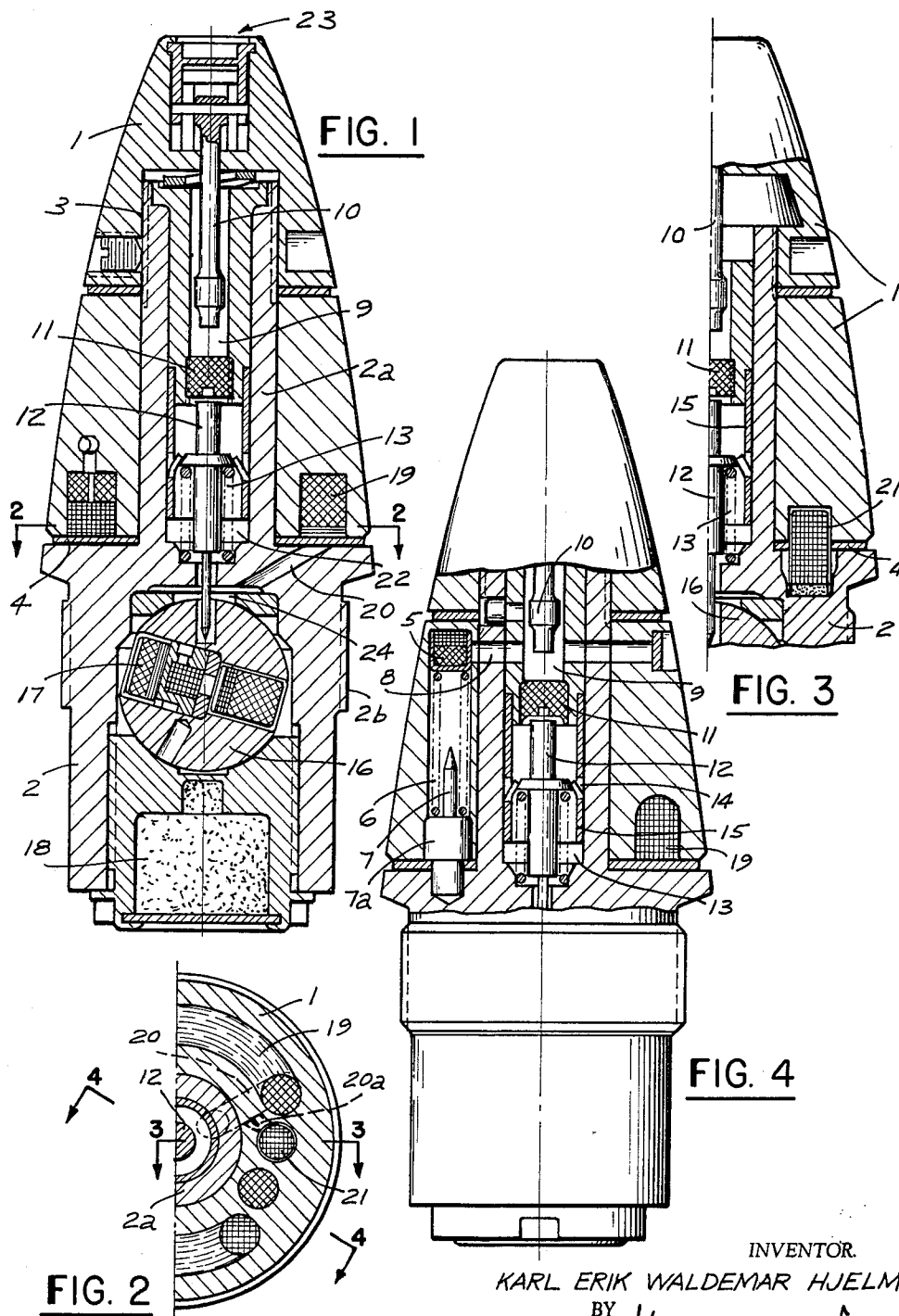
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FUZE FOR AN EXPLOSIVE PROJECTILE

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FUZE FOR AN EXPLOSIVE PROJECTILE

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The present invention relates to a fuze for an explosive projectile and, more particularly, to a fuze of the kind which is initiated when the front or nose part thereof is broken off at a predetermined plane due to the fuze striking the target at an acute angle in reference to the trajectory of the projectile.

Obviously it is desirable that the fuze is initiated by any impact upon the target irrespective of whether the fuze strikes the target squarely, at an acute angle or even only with a glancing blow. Various initiating devices for fuzes of this kind have been developed to serve the purpose such as mechanical initiating devices which are activated when the nose part of the fuze is broken off. Devices of this type, while suitable for many purposes, are not suitable for instantaneous high sensitivity fuzes as such fuzes should have a minimum of moving parts.

It is the broad object of the invention to provide for a fuze of the general kind above referred to, a novel and improved fuze initiating means which is activated by separation of the nose part and the rear part of the fuze and does not require moving parts.

A more specific object of the invention is to provide a novel and improved fuze of the general kind above referred to which is initiated by chemo-physical action and, more particularly, by the ignition of a combustible mass in response to the breaking off of the nose part of the fuze.

Another more specific object of the invention is to provide a novel and improved fuze of the general kind above referred to which is initiated by the ignition flash of a combustible mass which in turn is ignited by the friction to which it is exposed when the nose part and the rear part of the fuze are separated due to the impact upon the target.

A still more specific object of the invention is to provide a novel and improved fuze of the general kind above referred to in which existing ducts in the fuze are used to direct the flash generated by the ignition of the friction-sensitive combustible mass upon a detonator of the fuze, thereby activating the same.

Other and further objects, features and advantages of the invention will be pointed out hereinafter and set forth in the appended claims constituting part of the application.

In the accompanying drawing, a preferred embodiment of the invention is shown by way of illustration and not by way of limitation.

In the drawing:

FIG. 1 is an elevational sectional view of a fuze according to the invention;

FIG. 2 is a section taken on line II—II of FIG. 1;

FIG. 3 is a section taken on line III—III of FIG. 2; and

FIG. 4 is an elevational view, partly taken in section, along line IV—IV of FIG. 2 of the fuze.

Referring now to the figures in detail, the exemplified fuze comprises a fuze body formed by a nose or front part 1 and a rear part 2. The nose part and the rear part are joined by an extension 2a of reduced diameter protruding from the top wall of rear part 2 and screwed into the nose part. The nose part and the rear part face each other with plane surfaces, separated by a narrow circumferential gap in which is placed a packing or sealing ring 4. Due to the frangible body part formed by the reduced diameter of extension 2a and the gap, the nose part and the rear part will separate at the level of the gap when

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the fuze impacts upon the target at an acute angle in reference to the trajectory of the fuze. The rear part of the fuze should be visualized as being screwed into the casing of a projectile and is provided for that purpose with external threads 2b.

The fuze comprises a detonator 5 of conventional design. The detonator is disposed in a cavity formed in the nose part which also accommodates a striker assembly comprising a mechanism 7a of conventional design and the pointed striker pin 7. The detonator 5 is slidable within its cavity and urged into the illustrated position in which it is spaced apart from the stationary striker pin, by a loaded coil spring 6. A radial channel 8 leads from the cavity for detonator 5 to an axially disposed channel 9. This channel accommodates a push rod 10 which is axially movable within the channel and mounted at its upper end in a concussion device 23, which should be visualized as being of conventional design and causes displacement of rod 10 deeper into the fuze body when the fuze strikes the target at about a right angle. Channel 9 further accommodates a delay plug 11 made of a combustible material. The delay plug is stationary within channel 9, for instance by being threaded into a wall thereof and restrains an upward displacement of an impact rod 12 which is urged upwardly by a loaded coil spring 13. Rod 12 is further restrained from such upward movement by engagement with noses or lugs 14 lanced out of the material of a sleeve 15 which in turn is axially slidable within channel 9. As can best be seen in FIG. 1, an upward displacement of the sleeve is prevented by engagement of the upper edge of the sleeve with a shoulder formed within the channel, but the sleeve can move downwardly within the limits of clearance 22. The rod 12 is downwardly extended to form a pin 12a which in FIG. 1 is shown to engage a radial bore formed in a rotor 16. The rotor is disposed in the rear part of the fuze and accommodates a second detonator 17 of conventional design. As shown in FIG. 1, pin 12a restrains the rotor in a rotational position in which detonator 17 is out of axial alignment with impact rod 12 and also with an initiating charge 18 which is disposed at the bottom end of the fuze. Charge 18 serves to initiate explosion of the charge of the projectile to which the fuze is attached. The rotor is so balanced that it will turn into the position of alignment with rod 12 and charge 18 by the action of the centrifugal force acting upon it due to the spinning of the projectile and the fuze attached to it during flight when pin 12a is withdrawn from the rotor.

The fuze further comprises a combustible delay composition 19 which is disposed in the nose part of the fuze adjacent to the plane end wall thereof. This delay composition is in the form of a three-quarter ring, as can best be seen in FIG. 2. One end of the composition is connected by a duct 20 leading from the composition through the rear part of the fuze into a space 24 which in turn is in alignment with detonator 17 when the same is axially aligned with pin 12a of impact rod 12.

The fuze finally comprises a combustible composition 21 which is so arranged that it extends into the nose part and the rear part of the fuze body across the gap separating the two parts. Composition 21 is friction-sensitive, that is, it will become ignited if exposed to strong friction. Compositions of this kind are well known in the art. A suitable composition is for instance lead azide. As is shown in FIG. 2, composition 21 is disposed closely adjacent to duct 20 so that the fuze body material separating duct 20 from composition 21 will collapse when the composition is ignited, thus establishing a connection between composition 21 and duct 20 and through the duct to detonator 17. Composition 21 may also be directly connected with duct 20 by means of a short duct 20a, as indicated in FIG. 2.

The fuze as hereinbefore described, functions as follows:

Let it be assumed that the fuze is attached to a projectile and that the latter has been fired from a rifled barrel. During the rapid acceleration of the projectile and with it, of the fuze, detonator 5 will be forced against the point of striker pin 7, thereby igniting detonator 5. At the same time, sleeve 15 will be forced to move into clearance 22, that is, toward the rotor. Rod 12 will remain stationary for the time being and as a result noses 14 will be forced back into the sleeve wall, thereby freeing rod 12. The ignition flash from detonator 5 travelling through duct 8 will ignite delay plug 11 and also through a duct (not shown), the delay composition 19 at the end thereof nearest to detonator 5. When the acceleration decreases below a predetermined value, spring 13 will exert an upward pressure upon the impact rod 12 which is now free of the restraint by noses 14. After plug 11 has been burned out and more or less disappeared, impact rod 12 is moved upwardly by the action of spring 13 until it abuts against the lower end of push rod 10. As a result of the upward movement of rod 12, pin 12a releases rotor 16 which, due to the centrifugal force of the spinning projectile, rotates into the position in which detonator 17 is aligned with channel 9 and initiating charge 18. The fuze is now armed.

In the event that the nose part of the fuze strikes a surface of the target approximately squarely causing the concussion mechanism 23 to function, the push rod through impact rod 12 will initiate the detonator 17 which in turn ignites the initiating charge 18.

If the fuze is not initiated through impact upon a target after a predetermined period of time, the flash from the delay composition 19 when the combustion of that composition reaches duct 20 will cause ignition of detonator 17 through duct 20, whereby self-destruction of the projectile is accomplished.

In the event the nose of the fuze strikes a target surface which forms an angle of for instance about 10° with the trajectory of the projectile, the fuze will break apart along the plane defined by packing 4. As previously explained, friction-sensitive composition 21 bridges said plane so that the composition is subjected to a strong friction when the parts of the fuze separate. As a result, composition 21 is ignited and the ignition flash of the composition causes either collapse of thin material separating the composition from duct 20 or passes directly into the duct 20 through a branch duct 20a, thus igniting detonator 17 which, in turn, initiates the initiating charge 18 as previously described.

While the invention has been described in detail with respect to a certain now preferred example and embodiment of the invention, it will be understood by those skilled in the art after understanding the invention that various changes and modifications may be made without departing from the spirit and scope of the invention, and it is intended, therefore, to cover all such changes and modifications in the appended claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A fuze for an explosive projectile, comprising a fuze body having a nose part and a rear part, a frangible part joining said two parts and designed to effect separation of the nose part and the rear part in response to an impact of the fuze upon a target at an acute angle in reference to a trajectory of the projectile, facing surface portions of said nose part and said rear part including aligned recesses, a combustible composition ignitable by friction provided within said recesses substantially filling the same thereby extending across said frangible part into the nose part and the rear part of the fuze body, and detonating means disposed within the rear part of the fuze, said fuze body including a passage for connecting

said recesses containing the combustible composition to said detonating means to activate said means by an ignition flash of the composition when the latter is ignited by the friction to which it is subjected when the nose part and the rear part are separated by impact.

2. A fuze according to claim 1 wherein said nose part and said rear part each have opposing plane end walls, said end walls being separated by a narrow peripheral gap, an extension of less cross-sectional area than either part at said gap extending from one part into the other across said gap to join said parts, said recesses being juxtaposed to said gap whereby said combustible composition extends across said gap partly into the nose part and partly into the rear part of the fuze body.

3. A fuze for an explosive projectile, comprising a fuze body having a nose part and a rear part, a frangible part joining said parts to effect separation of the nose part and the rear part in response to an impact of the fuze upon a target at an acute angle in reference to a trajectory of the projectile, detonating means disposed within the rear part of the fuze, a combustible delay composition disposed within the fuze body, said fuze body including a duct leading from said delay composition to said detonating means to initiate the latter in response to an ignition of the delay composition and burning of the same for a delay period, facing surface portions of the nose part and the rear part including aligned recesses, a combustible composition ignitable by friction provided within said recesses substantially filling the same thereby extending across said frangible part into the nose part and the rear part of the fuze body, said recesses being disposed within the fuze body immediately adjacent to a wall portion thereof defining said duct whereby upon ignition of the friction-ignitable combustible composition due to separation of the nose part and the rear part by impact, the resulting ignition flash causes collapse of the wall portion separating the friction-ignitable combustible composition and said duct and through the duct to said detonating means to activate the same.

4. A fuze for an explosive projectile, said fuze comprising a fuze body having a nose part and a rear part, a frangible part joining said parts to effect separation of the nose part and the rear part in response to an impact of the fuze upon a target at an acute angle in reference to a trajectory of the projectile, opposing wall portions of said nose part and said rear part including aligned recesses, a combustible composition ignitable by friction provided within said aligned recesses and substantially filling the same, thereby extending across said frangible part into the nose part and the rear part of the fuze body, detonating means disposed within the rear part of the fuze, and a combustible delay composition disposed within the fuze body, said fuze body including a first duct leading from said delay composition to said detonating means to initiate the latter upon ignition of the delay composition and burning of the same for a delay period, said fuze body further including a second duct leading from said friction-ignitable composition into said first duct to activate the detonating means by an ignition flash of said friction-ignitable composition when the same is ignited by the friction to which it is subjected when the nose part and the rear part are separated by impact.

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