

April 23, 1957

R. APOTHÉLOZ

2,789,507

FUZE FOR ROCKET PROJECTILES

Filed June 14, 1952

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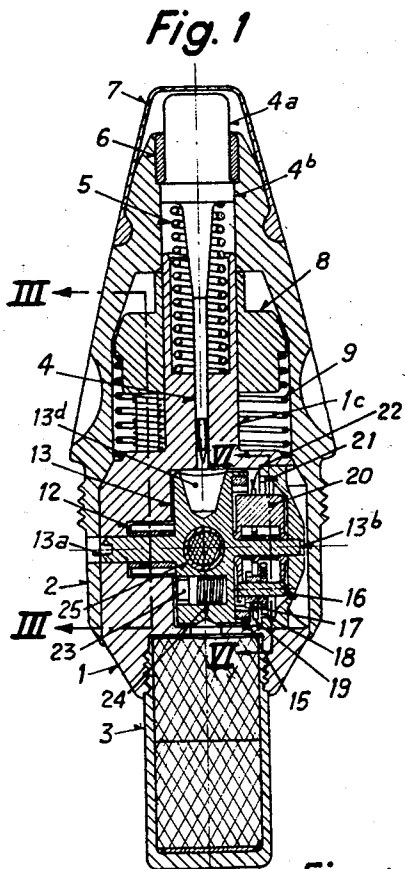
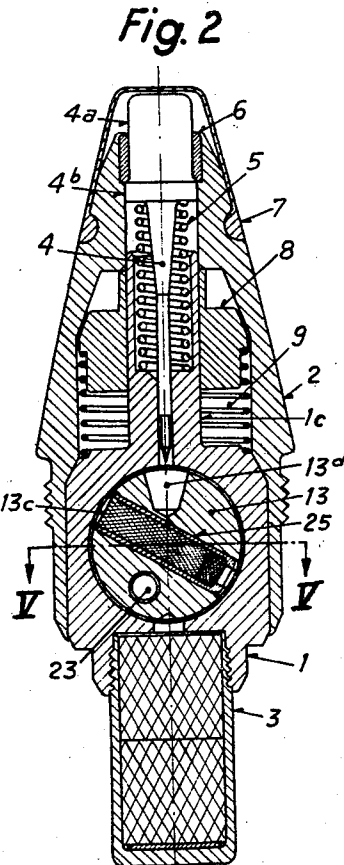
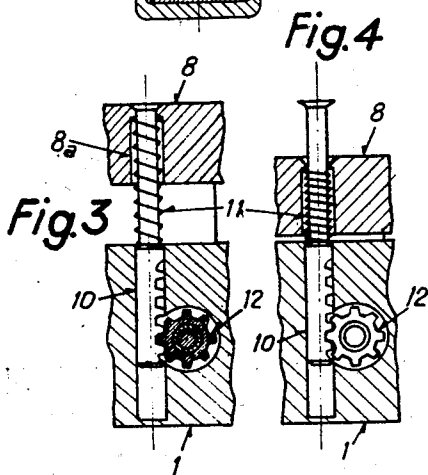
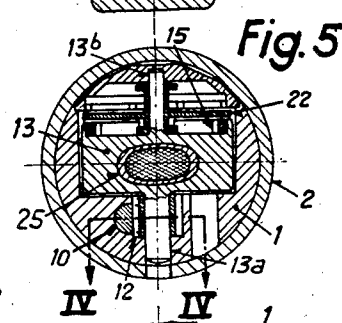
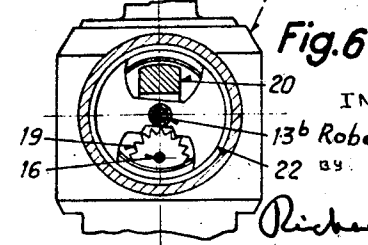


Fig. 6

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Fig. 7

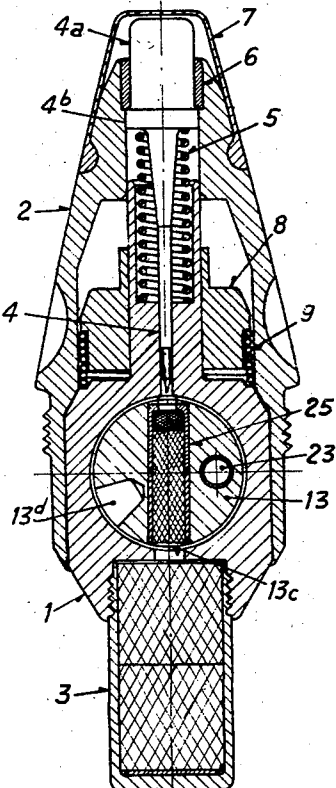


Fig. 8

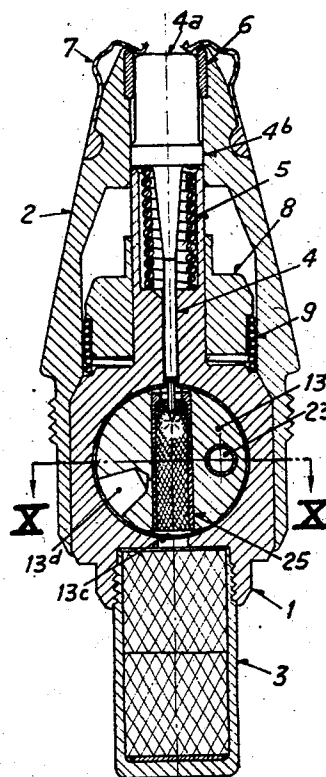


Fig. 9

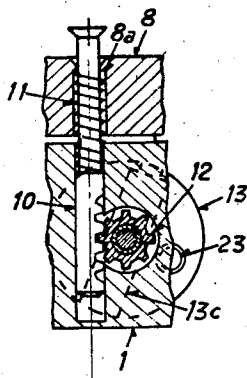
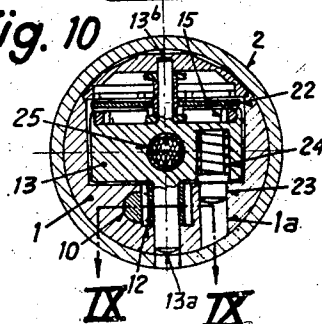


Fig. 10



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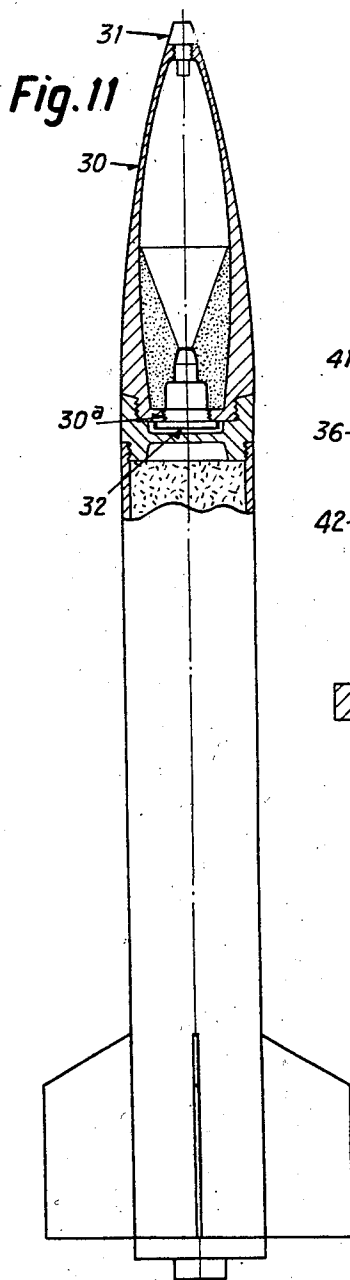
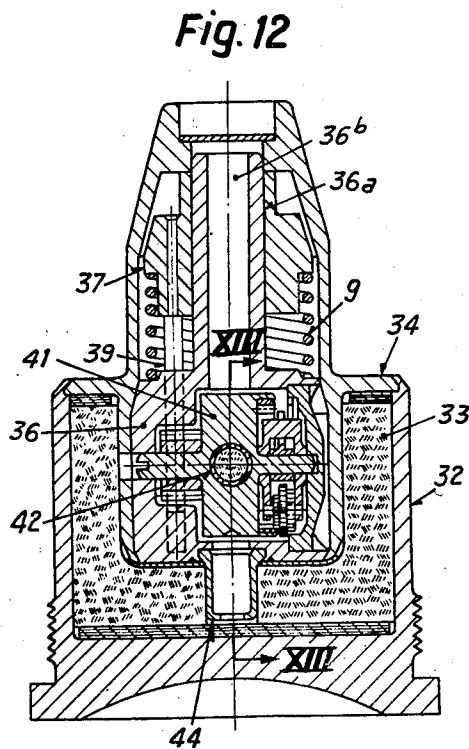
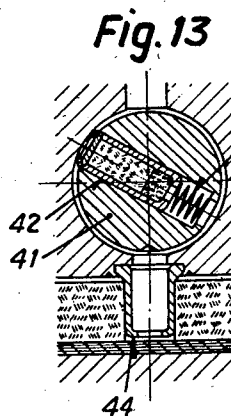
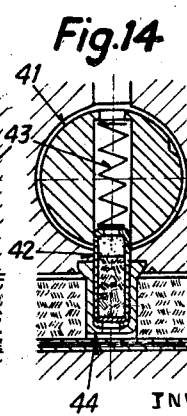
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FUZE FOR ROCKET PROJECTILES

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FUZE FOR ROCKET PROJECTILES

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Fig. 15

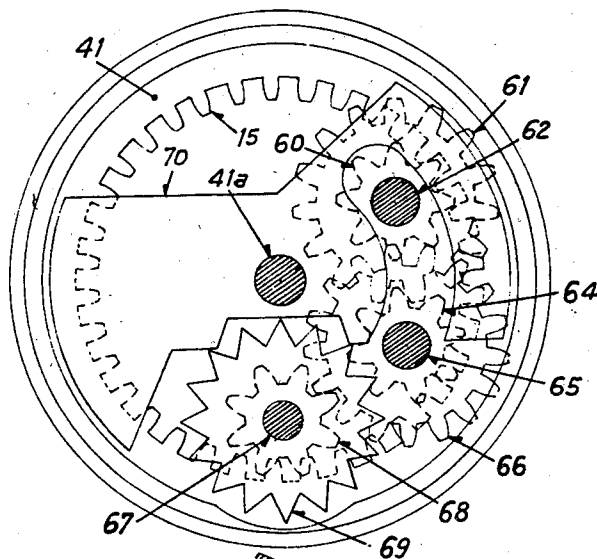
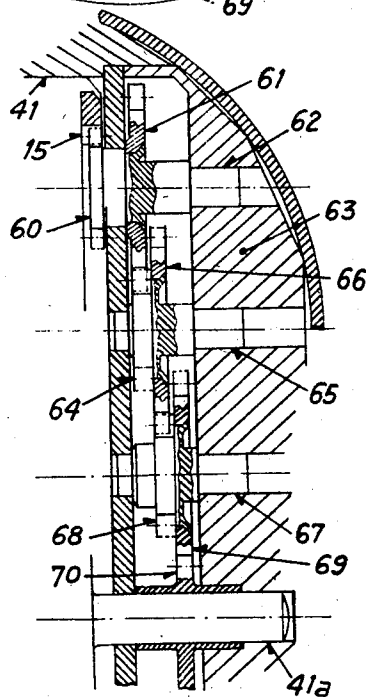


Fig. 16

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FUZE FOR ROCKET PROJECTILES

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Application June 14, 1952, Serial No. 293,557

5 Claims. (Cl. 102—80)

The present invention relates to a fuze for rocket projectiles comprising a longitudinally movable striker and a rotor rotatable transversely to the fuze axis which contains a primer cap in a bore perpendicular to the rotor axis and can be rotated from a safe position in which the bore containing the primer cap is tilted out of the path of the striker, to an active position in which the primer cap is situated in the path of the striker.

Fuzes of this kind are known with spinning projectiles. In such fuzes centrifugal forces are used for tilting the rotatable body. In the fuze according to the present invention, however, not the centrifugal force but the longitudinal acceleration of the rocket projectile is used for driving the rotatable body.

The fuze in accordance with the present invention is characterized in that the rotor is operatively connected with a body longitudinally movable in the fuze casing in such a manner that the forces produced by the longitudinal acceleration of the rocket projectile are usable for moving the rotor and that furthermore an oscillating body adapted to control the rotor movement and retaining means adapted to lock the rotor in its operative position are provided.

The accompanying drawing illustrates several embodiments of the invention. In the drawing:

Fig. 1 is a longitudinal, sectional view of the fuze in safe position;

Fig. 2 is a longitudinal, sectional view of the fuze taken perpendicular to the view in Fig. 1;

Fig. 3 is a sectional view, taken along the line III—III in Fig. 1;

Fig. 4 is a sectional view, taken along the line IV—IV in Fig. 5;

Fig. 5 is a sectional view, taken along the line V—V in Fig. 2;

Fig. 6 is a sectional view, taken along the line VI—VI in Fig. 1;

Fig. 7 is a longitudinal, sectional view of the fuze in armed position;

Fig. 8 is a longitudinal, sectional view of the fuze at the moment of impact;

Fig. 9 is a sectional view, taken along the line IX—IX in Fig. 10;

Fig. 10 is a sectional view, taken along the line X—X in Fig. 8;

Fig. 11 is a longitudinal, sectional view of the rocket projectile with shaped charge;

Fig. 12 is a longitudinal, sectional view of the fuze of the shaped charge;

Fig. 13 is a sectional view, taken along the line XIII—XIII in Fig. 12;

Fig. 14 is a sectional view, taken along the same line with the fuze in armed position;

Fig. 15 is a view of another embodiment of the escapement gear;

Fig. 16 is a developed view of the escapement gear shown in Fig. 15.

Referring now particularly to Figs. 1 and 2, there is shown a fuze body 1 disposed in the fuze casing 2 and carrying, at its rear end, the booster charge 3. The rotor 13 is arranged in a recess of the fuze body 1 and is rotatable about an axis that is perpendicular to the longitudinal axis of the fuze. In a through-going bore the rotor contains the primer cap 25 which, in safe position, is rotated out of the path of the longitudinally movable striker 4. In this position of the rotor 13 a blind bore 13d is situated beneath the point of the striker 4. The striker 4 is subjected to the action of the spring 5. In normal position the shoulder 4b of the striker 4 abuts the stop spring 6 in the point of the fuze. The head 4a of the striker 4 projects from the fuze casing 2 and is covered by a cap 7 of plastic material.

The annular body 8 is movably disposed on a cylindrical extension 1c of the fuze body 1. The annular body is pressed forwards by the spring 9. The tooth rack pin 10 is movably disposed in a bore 8a of the annular body 8 which is parallel to the fuze axis. The rack pin 10 is supported by a spring 11 resting against the annular body 8 and projects into a bore of the fuze body 1 where its rack engages a pinion 12 fastened to the rotor shaft. Thereby the longitudinal movement of the annular body 8 is transmitted through the spring 11, the rack pin 10 and the pinion 12 into a rotational movement of the rotor 13. Due to the rotary movement of the rotor 13 the bore containing the primer cap 25 is rotated so as to lie in the axis of the fuze so that the primer cap 25 is in the path of the striker 4 and is directly connected to the booster charge 3 by a bore in the fuze body. In a bore parallel to its axis the rotor carries a pin 23 subjected to the action of a spring 24. When the rotor reaches arming position the pin 23 engages a corresponding bore 1a in the fuze body 1 and locks the rotor in this position (Fig. 10).

An escapement mechanism is provided for controlling the rotor movement with respect to time. The carrier 20 is rotatably disposed on the shaft 13b of the rotor 13, and carries, on a shaft 16, the rotatable gears 17, 18 and 19 which are rigidly interconnected. The gear 17 engages a gear 15 seated frictionally on the rotor 13. The gear 18 engages a gear ring 21 seated frictionally in the fuze body 1. An oscillator body 22 is rotatably disposed on the rotor shaft 13b between the arms of the carrier 20 and is operatively connected with the gear 19 having pointed teeth.

Operation of the fuze is as follows:

In transport, or safe position (Figs. 1–3), the annular body 8 is pressed against the front part of the bore in the fuze casing 2 by the spring 9. If the rocket projectile is dropped on to the fuze in safe position, the point of the striker 4 enters the blind bore 13d of the rotor, which in safe position of the fuze is aligned with the striker. After pressure is removed the striker 4 is returned to the normal position by the spring 5. If the rocket projectile is dropped on the tail the annular body 8 will move to the rear only by a small distance, due to the short acceleration and the action of the escapement mechanism, until it is returned to its initial position by the action of the spring 9. The rotor 13, which has also moved slightly, is thereby also returned to normal position by the rack pin 10. The fuze therefore cannot be armed by dropping.

If the primer cap 25 is ignited inadvertently in safe position, the detonation will not be transmitted to the booster charge, i. e. the fuze is detonator safe.

Due to the acceleration of the rocket projectile on firing the annular body 8 slides to the rear against the action of the spring 9, thereby tensioning the spring 11 (Fig. 4). The latter presses the rack pin 10 to the rear (Fig. 9) which rotates the rotor 13 via the pinion 12. The

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rotary movement of the rotor is delayed by the oscillator body 22 through the escapement gear (Fig. 6) so that a certain time elapses until the rotor 13 reaches its operative position in which the primer cap 25 is in the path of the striker 4 (Fig. 7). As soon as the rotor reaches this position, the pin 23 is pressed into the bore 1a by the spring 24 thereby locking the rotor. The fuze is then armed (Fig. 10).

If the rocket projectile hits an obstacle before the fuze is armed no detonation can occur, also the striker 4 is actuated. Due to the delayed arming feature of the fuze a detonation is therefore only possible after the rocket projectile has flown a certain distance after launching; i. e. the fuze is also pre-launcher safe.

On impact on a target the striker 4 is thrown to the rear and enters the primer cap 25, which then detonates and fires the booster charge 3 which is aligned with the bore 13c of the rotor 13.

Figs. 11 to 14 show another embodiment of the fuze which is particularly suitable for use with shaped charges.

A simple impact fuze 31 is threaded into the point of the warhead 30. At the rear end of the warhead 30 a casing 32 is disposed in a bore 30a and fastened as by a thread. The casing 32 contains the booster charge 33 and the fuze casing 34. The fuze mechanism contained in the fuze casing 34 is substantially the same as in the embodiment described above and illustrated in Figs. 1 to 10. However, the rack pin 39 is rigidly connected to the annular body 37 so that the movement of the latter is transmitted to the rotor directly without the intermediate of a spring. Firing of the primer cap 42 in the bore of the rotor 41 is not by a striker, as in the previous example, but by an ignition flash produced by the impact fuze 31 and directed to the primer cap through the bore 36b of the fuze body 36. The primer cap 42 is movably disposed in the bore of the rotor and supported by a spring 43. Disposed in the lower part of the fuze body 36 is a sleeve 44 into which the primer cap is pushed by its spring 43 when the rotor 41 reaches its operative position, whereby the rotor is locked.

Operation of the fuze is substantially similar to the example described previously with reference to Figs. 1 to 10.

If the fuze drops onto its nose in safe position the impact fuze will be actuated, but the ignition flash produced will pass through the bore 36b in the extension 36a of the fuze body 36 and hit the rotor, which is in the safe position shown in Fig. 13, and the primer cap will not function.

On firing the rotor is again rotated by the inertia force of the annular body 37. However, as the body 37 is rigidly connected to the rack pin 39 (Fig. 12) the inertia force is used directly, without any intermediate springs, to move the rack pin 39 to the rear and thereby to rotate the rotor. Deceleration of the rotor is again effected by an escape mechanism with an oscillator body, as described in the first example. When the rotor reaches its operative position, the primer cap 42 is pushed to the rear and into the sleeve 44 by its spring 43 and locks the rotor 41 in this position (Fig. 14).

In Figs. 15 and 16 another embodiment of the escapement mechanism is illustrated. A pinion 60, rigidly connected with a gear 61 by means of a shaft rotatably disposed in the fuze body 63, meshes with the gear ring 15 of the rotor. The gear 61 meshes with the gear 64 on the shaft 65. The shaft 65 also carries a gear 66 engaging with the gear 68 disposed on the shaft 67. The gear 69 with pointed teeth is coupled with the gear 68 and is in engagement with the oscillator body 70 rotatably disposed on the shaft 41a of the rotor 41.

The effect of this mechanism corresponds to that of the epicyclic escapement gear described previously.

The embodiments described indicate, of course, only some of the many possibilities for practical realization of the invention as defined in the claims. Instead of the

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annular body, for example, a longitudinally movable body of any suitable shape could be used.

I claim:

1. A fuse for rocket projectiles, comprising a fuse body having a longitudinal axis, a rotor rotatably mounted in said fuse body transversely to said longitudinal axis, said rotor being rotatable between a safe position and an operative position and having a through bore formed therein, the axis of said bore coinciding with said longitudinal axis in the operative position of said rotor, a primer cap in said bore, means detonating said primer cap on impact of said fuse when said rotor is in its operative position, another body slidable longitudinally relatively to the first-mentioned body, a spring engaging the second-mentioned body and adapted to maintain it in a forward position, said spring being compressed and the second-mentioned body being moved rearwardly by acceleration forces during flight of the projectile, means connected with the second-mentioned body and said rotor for transforming the longitudinal sliding movement of the second-mentioned body into a rotary movement of said rotor, means connected with the rotor for delaying the rotary movement thereof, and means connected with said rotor for locking it in its operative position.

2. A fuse for rocket projectiles, comprising a fuse body having a longitudinal axis, a rotor rotatably mounted in said fuse body transversely to said longitudinal axis, said rotor being rotatable between a safe position and an operative position and having a through bore formed therein, the axis of said bore coinciding with said longitudinal axis in the operative position of said rotor, a primer cap in said bore, means detonating said primer cap on impact of said fuse when said rotor is in its operative position, another body slidable longitudinally relatively to the first-mentioned body, a spring engaging the second-mentioned body and adapted to maintain it in a forward position, said spring being compressed and the second-mentioned body being moved rearwardly by acceleration forces during flight of the projectile, a toothed rack connected with the second-mentioned body, a pinion connected with the rotor and meshing with said tooth rack, means connected with the rotor for delaying the rotary movement thereof, and means connected with said rotor for locking it in its operative position.

3. A fuse for rocket projectiles, comprising a fuse body having a longitudinal axis, a rotor rotatably mounted in said fuse body transversely to said longitudinal axis, said rotor being rotatable between a safe position and an operative position and having a through bore formed therein, the axis of said bore coinciding with said longitudinal axis in the operative position of said rotor, a primer cap in said bore, a striker movable longitudinally on impact of said fuse to detonate said primer cap when said rotor is in its operative position, another body slidable longitudinally relatively to the first-mentioned body, a spring engaging the second-mentioned body and adapted to maintain it in a forward position, said spring being compressed and the second-mentioned body being moved rearwardly by acceleration forces during flight of the projectile, means connected with the second-mentioned body and said rotor for transforming the longitudinal sliding movement of the second-mentioned body into a rotary movement of said rotor, means connected with the rotor for delaying the rotary movement thereof, and means connected with said rotor for locking it in its operative position.

4. A fuse for rocket projectiles, comprising a fuse body having a longitudinal axis, a rotor rotatably mounted in said fuse body transversely to said longitudinal axis, said rotor being rotatable between a safe position and an operative position and having a through bore formed therein, the axis of said bore coinciding with said longitudinal axis in the operative position of said rotor, a primer cap in said bore, an impact fuse for detonating said primer cap by an ignition flash when said rotor is in its operative position, another body slidable longitudinally relatively

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to the first-mentioned body, a spring engaging the second-mentioned body and adapted to maintain it in a forward position, said spring being compressed and the second-mentioned body being moved rearwardly by acceleration forces during flight of the projectile, means connected with the second-mentioned body and said rotor for transforming the longitudinal sliding movement of the second-mentioned body into a rotary movement of said rotor, means connected with the rotor for delaying the rotary movement thereof, and means connected with said rotor for locking it in its operative position.

5. A fuse for rocket projectiles, comprising a casing, a fuse body mounted in said casing and having a longitudinal axis, a rotor rotatably mounted in said fuse body transversely to said longitudinal axis, said rotor being rotatable between a safe position and an operative position and having a through bore formed therein, the axis of said bore coinciding with said longitudinal axis in the operative position of said rotor, a primer cap movably mounted in said bore, means detonating said primer cap on impact of said fuse when said rotor is in its operative position, another body slidable longitudinally relatively to the first-mentioned body, a spring engaging the second-mentioned body and adapted to maintain it in a forward position, said spring being compressed and the second-

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mentioned body being moved rearwardly by acceleration forces during flight of the projectile, means connected with the second-mentioned body and said rotor for transforming the longitudinal sliding movement of the second-mentioned body into a rotary movement of said rotor, means connected with the rotor for delaying the rotary movement thereof, and a spring engaging said primer cap, the last-mentioned spring moving said primer cap to cause it to project into a recess formed in said casing when said rotor is in its operative position.

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