Aug. 23, 1960 A. G. MANTEL 2,949,856

FUZES HAVING A SELF-DESTRUCTIVE ACTION

Filed Oct. 10, 1956

FIG. 1a

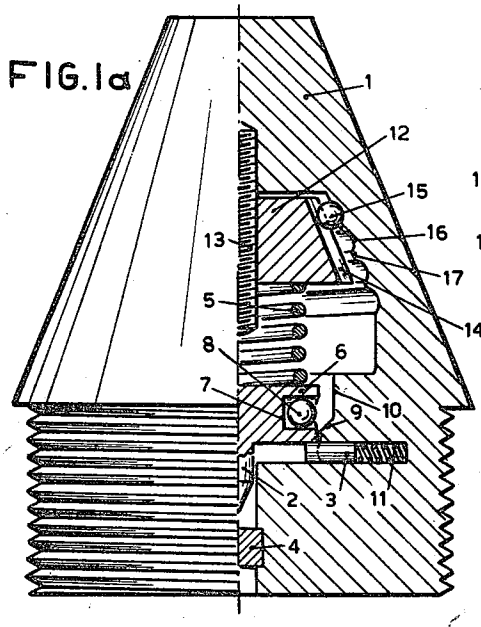


FIG. 1b

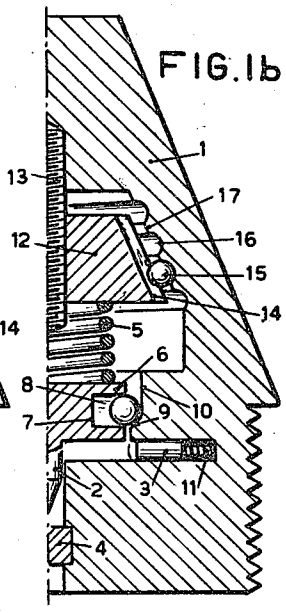


FIG. 1c

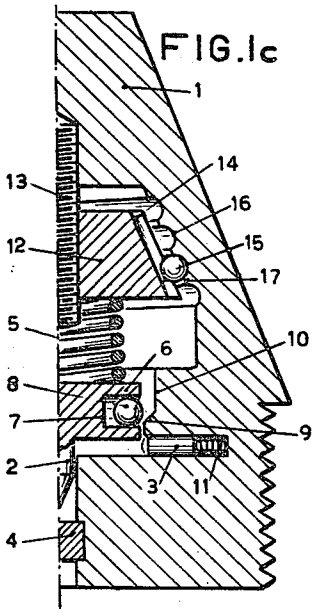
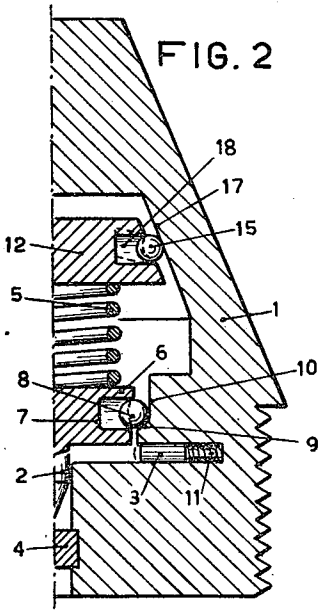


FIG. 2



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FUZES HAVING A SELF-DESTRUCTIVE ACTION

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The invention relates to a fuze having a self-destructive action for a projectile and provided with a firing mechanism which after the projectile has been discharged is locked in its inactive position by means of at least one locking member, the firing mechanism being influenced by a spring releasing said mechanism out of its inactive position as soon as the angular speed of the projectile has been decreased to a predetermined value. Said means for releasing the locking member or members of the firing mechanism results in a self-destruction of the projectile before it reaches the ground and also when it has not reached its target.

With fuzes of the kind referred to above the projectile will, therefore, automatically explode on that point of its path, where its angular speed is decreased to a value, at which the pressure of the spring can overcome the influence of said speed on the locking of the firing mechanism. With the fuzes known up to now, said point, however, is not situated at a fixed distance from the gun, as said distance depends on the translatory speed and the angular speed, with which the projectile leaves the gun and both said speeds are smaller according to the wear at the inner wall of the barrel, whereby the projectile encounters less resistance so that the gas pressure generated by the explosion of the propelling charge will be smaller. In consequence thereof the bursting point of the projectile will lie at a shorter distance from the gun on heavier wear of the gun barrel.

The invention has for its object to have a self-destructing projectile burst at a fixed distance independently of the wear of the gun barrel. According to the invention the spring loading the firing mechanism is not compressed to a predetermined fixed degree but a slidable pressure member is acting on the spring and is displaced under the influence of the angular speed of the projectile at the beginning of its flight in such a manner that at smaller angular speed the spring pressure is correspondingly smaller. If, therefore, with said arrangement the angular speed of the projectile at the beginning of its flight is smaller, e.g. due to the wear of the gun barrel, also the tension of the spring will correspondingly be smaller, so that the lock of the firing mechanism will be released by the spring at a point of the flight, where the angular speed of the projectile is smaller.

The invention will be further described with reference to the accompanying drawing illustrating two embodiments of a fuze according to the invention constructed as a percussion fuze.

In the drawing Figs. 1*a*, 1*b* and 1*c* each show half a longitudinal section of a fuze according to the first embodiment with three different positions of the moving parts thereof. In Fig. 1*a* the section is completed with half an elevational view of the fuze.

Fig. 2 is half a longitudinal section of a fuze according to the second embodiment with the moving parts in the position when the projectile has just left the gun barrel.

The fuze body 1 contains the striker pin 2, which in the position of rest of the fuze shown in Fig. 1*a* is retained in its inactive position by a locking bolt 3. Below the striker pin the percussion cap 4 is located and the compression spring 5 is pressing on the collar 6 of the striker pin. In the circumference of said collar 6 one or more recesses 7 for a ball 8 are provided which ball under the influence of the centrifugal action due to the spinning of the projectile after leaving the gun is urged in the angle between the inclined surface 9 and the cylindrical wall 10 of the cavity of the fuze body, as appears from Fig. 1*b* showing the movable parts in their position after the discharge of the projectile.

The locking bolt 3 is then moved outwards against the action of a spring 11 under the influence of the centrifugal force so that said bolt releases the striker pin 2.

The spring 5 is compressed by a pressure disc 12 screwed on a threaded pin 13 secured in the fuze body 1. This disc 12 is provided on its circumference with one or more grooves 14 extending along a generating line of the conical circumferential surface of the pressure disc. A ball 15 lies in the groove 14 of the pressure disc, with said ball being adapted to run in a helical groove 16 in the conical wall 17 of the fuze body.

In the position shown in Fig. 1*a* the spring 5 may have a slight initial tension. If, however, the projectile is rotating about its axis the ball 15 will, due to centrifugal force, run in the groove 16 towards the wider part of the conical wall 17. This causes the ball to turn the pressure disc 12 on the threaded pin 13 with respect to the fuze body, whereby the pressure disc is moved axially in the direction towards the striker pin 2 and the tension of the spring is consequently increased. If the angular speed of the projectile is greater, the tension of the spring will be greater because the centrifugal force on the ball 15 is increased and moves the ball further.

In the position according to Fig. 1*b*, when the projectile is still at the beginning of its path, the angular speed of the projectile is the greatest and the centrifugal force on the ball 8 locking the striker pin 2 is so large that the pressure of the spring 5 can not overcome this force on the ball.

Fig. 1*c* shows the moving parts of the fuze in the position which they occupy during the flight of the projectile when its angular speed is decreased to such an extent that the pressure of the spring 5 overcomes the centrifugal force urging the ball 8 of the striker pin 2 in the angle between the inclined surface 9 and the cylindrical wall, so that the pin is released and strikes the percussion cap 4. The pressure disc 12 remains stationary and therefore, constitutes a supporting surface for the spring as the screw thread on the pin 13 is self-locking.

In the embodiment shown in Fig. 2, the striker pin 2 is initially locked by the bolt 3 and after the projectile is discharged the pin is locked by the ball 8 which has the same function as in the embodiment according to Figs. 1*a*–1*c*. The pressure disc 12, for varying the pressure of the spring 5, cooperates with the conical wall 17 of the cavity in the fuze body 1, so that the threaded pin 13 of the first embodiment is omitted here. The pressure disc 12 is provided with one or more balls 15, which are located in radial holes 18 of the pressure disc. At the beginning of the flight of the projectile the ball 15 will, under the influence of the centrifugal force exerted on the ball and generated by the large angular speed of the projectile, be moved towards the wider part of the conical wall 17, whereby the pressure disc 12 is displaced in the direction for compressing the spring 15. If during the flight of the projectile the angular speed decreases, the ball 15 will not move to the narrower part of the conical wall 17 as the angle of the cone may be chosen so that a self-locking action is obtained.

If, however, a certain point of the path is reached, where the angular speed of the projectile is decreased to a sufficient extent, the pressure of the spring will overcome the centrifugal force exerted on the ball **8** locking the striker pin **2**, so that said pin is released and strikes the percussion cap **4**. The pressure disc **12** then constitutes a fixed supporting surface for the spring by the self-locking action of the conical wall **17**. For obtaining said self-locking action of the pressure disc **12** also the side walls of the recess **18** may be inclined, as shown with dotted lines in Fig. 2.

It is to be noted that the invention is not restricted to the described and illustrated embodiments as several modifications may be made therein within the scope of the invention. It is thus possible to have in the embodiment according to Fig. 2 the pressure disc **12** acting directly on the striker pin **2** and united with said pin; if desired, it being then required to place the spring **5** above the pressure disc **12**, so that said spring may be supported on the bottom of the cavity in the fuze body. As with such an arrangement the pressure disc for compressing the spring **5** should be moved towards the bottom of the cavity the conical wall for cooperation with the pressure disc must be directed oppositely to the wall **17** in Fig. 2. If also with said arangement the conical wall is made self-locking the ball **8** in Fig. 2 for locking the striker pin **2** may be omitted.

What I claim is:

1. A self-destroying fuze for a rotatable projectile, comprising a fuze body provided with an interior chamber and firing mechanism within said chamber and including a firing device in said chamber movable from a non-detonating to a detonating position, spring means in said chamber urging the firing device toward detonating position, first centrifugally operated locking means in the fuze body and normally engagable with the firing device for retaining the firing device in non-detonating position but movable in response to rotation of the projectile to free said firing device for movement toward detonating position under the influence of said spring means, second centrifugally actuated locking means caried by said firing device and engagable with a first wall portion of said interior chamber for retaining the firing device in non-detonating position in opposition to said spring means when said first centrifugally operated locking means is withdrawn from engagement with the firing device, and third centrifugally actuated means in said chamber engaging said spring means and coacting with an inclined surface of a wall portion of the chamber under the influence of centrifugal force and providing a driving connection to increase the tension of said spring means sufficiently to overcome the locking action of said second centrifugally actuated locking means, whereby the spring means is tensioned to provide detonation of the projectile proportionate to the angular speed of the projectile.

2. A self-destroying fuze according to claim 1 wherein said third centrifugally actuated means includes a pressure member movable in said chamber, said spring means being interposed between said pressure member and said firing device for urging the firing device toward detonating position.

3. A self-destroying fuze according to claim 2 wherein said third centrifugally actuated means includes a recess in the periphery of said pressure member and facing said inclined wall portion, and a roll element in said recess and moved by centrifugal force partially out of the recess into engagement with said inclined wall portion to move said pressure member axially toward the firing device, the longitudinal axis of said recess in the periphery of said pressure member being disposed at an acute angle relative to the inclined wall portion of the chamber.

4. A self-destroying fuze for a rotatable projectile, comprising a fuze body provided with an interior chamber and firing mechanism within said chamber and including a pressure member movable in said chamber, a firing device in said chamber movable from a non-detonating to a detonating position, a spring interposed between said pressure member and said firing device for urging the firing device toward detonating position, first locking means in the fuze body and normally engagable with the firing device for retaining the firing device in non-detonating position but movable in response to rotation of the projectile to free said firing device for movement toward detonating position, centrifugally actuated locking means cooperative with said firing device and engagable with a wall portion of said interior chamber for retaining the firing device in non-detonating position by centrifugal force in opposition to said spring when said first locking means is withdrawn from engagement with the firing device, a threaded pin fixed in the fuze body upon which the pressure member is mounted, a spiral groove in the portion of the chamber surrounding said pressure member, a roll element carried by said pressure member and moved by centrifugal force to cooperate with the spiral groove to thread the pressure member on the pin toward the firing device for increasing the spring pressure to overcome the action of said centrifugally actuated locking means, whereby the displacement of the pressure member is dependent upon the angular speed of the projectile to tension the spring and provide detonation of the projectile proportionate thereto.

5. A self-destroying fuze for a rotatable projectile, comprising a fuze body provided with an interior chamber and firing mechanism within said chamber and including a pressure member movable in said chamber, a firing device including a striker pin movable from a non-detonating to a detonating position, a spring interposed between said pressure member and said firing device to urge the latter into detonating position, a locking bolt in the fuze body and spring biased to be normally engagable with the firing device for retaining the firing device in non-detonating position but movable in response to rotation of the projectile to free said firing device for movement toward detonating position, a wall portion of said interior chamber being inclined inwardly toward the striker pin, a ball loosely seated in a recess in the periphery of the firing device and movable by centrifugal force into engagement with said wall portion for retaining the firing device in non-detonating position when the locking bolt is withdrawn from engagement with the firing device, a self locking threaded pin fixed in the fuze body, said pressure member being frusto-conical and threaded on said pin, that portion of the chamber surrounding the pressure member also being of frusto-conical shape substantially corresponding to that of said pressure member, a spiral groove in the frusto-conical portion of the chamber, a recess in the periphery of the pressure member, a roll element in the recess in said pressure member to be urged by centrifugal force toward the groove to thread the pressure member on the pin toward the firing device for increasing the spring pressure to overcome the centrifugal force retaining the ball against the inwardly inclined wall, whereby the displacement of the pressure member is dependent upon the angular speed of the projectile to tension the spring and provide detonation of the projectile proportionate thereto.

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