

The invention relates to a pre-barrel safety mechanism on a projectile with percussion fuse.

There is known from FR-A 11 98 830 a pre-barrel safety mechanism on a non-spin projectile with percussion fuse, in which the percussion needle is kept at a distance from the detonating charge carrier (detonator) by means of a band winding in the form of a spiral spring which is wound in one direction and which, for its part, is fixed in the tensioned state by means of a cage which overlaps it. In the event of discharge the cage is displaced axially forwards under the influence of the propellant gases so that the spiral spring is freed and can be released radially outwards, being applied against the inner wall of a cavity of the cage, said cavity being enlarged in diameter. This cavity is connected to the front region of the cage which fixes the tensioned spiral spring and has a correspondingly smaller internal diameter. The diameter of the cavity is dimensioned such that the released spiral spring no longer arrests the percussion needle, i.e. no longer holds the two parts of the detonating train, consisting of percussion needle and detonating charge carrier, which can be moved relative to each other, at a distance from each other. Upon contact at the target, the percussion needle can therefore move forwards towards the detonator and effect the latter's initiation. It is disadvantageous in this connection that the safety take-off takes place very quickly by means of the band winding wound in just one direction and can only be varied within very narrow limits.

A pre-barrel safety mechanism for spin projectiles with contact detonation is known from DE-A 24 57 947 in which there is provided a three-part band winding assembly, in which the inner band winding rests against blocking spheres for the purpose of arresting a contact pin of the detonating chain and is made of such material that it resists the radial pressure of the

blocking spheres without deformations. The central band winding as main winding determines the pre-barrel safety and the outer band winding determines, more particularly, the transportation safety. The main winding is then preferably wound up in the spin direction and the two other band windings are wound up in opposition to the spin direction. The opening of the band winding assembly is effected here exclusively by means of the centrifugal force acting fully on the spin projectile after departure from the barrel mouth, in which case the pre-barrel safety is determined by the main winding and thus within very narrow limits.

The object of the invention is a precise, simple safety device, which operates reliably over an adjustable and also longer temporal range, on the contact fuse of non-spin projectiles.

This object is achieved, basing considerations on DE-A 24 57 947, by a within barrel safety mechanism according to the preamble of claim 1 in accordance with the features of the characterising part of this claim.

This pre-barrel safety mechanism is intended for contact fuses of non-spin projectiles. The wound-up spiral spring assembly surrounded by the cage prevents, by its presence in the chamber between the two parts of the detonating chain, the approach of the percussion needle to the detonating charge carrier. When the cage slides off over the spiral spring assembly in the event of discharge, on account of its inertia, the outermost layer of the outer spiral spring immediately begins to be released. The release of the spiral spring occurs consecutively from the outside inwards, never simultaneously distributed over the whole spring length. According to the invention several spiral springs are wound one upon the other, in which case the winding direction changes for each spiral spring. As a result, each time, steadying and a

reversal of rotation of the remaining spring assembly results when there is a change-over from one spiral spring to another; the run-off of the next spiral spring running in an opposite direction thus commences in each case again at zero. The result of this is that already with three spiral springs wound in opposite directions considerable delay times can be brought about in a reliable and reproducible manner. This safety take-off is effected independently of a spinning movement of a projectile, as a result of which this pre-barrel safety mechanism is suitable for non-spin projectiles.

The spiral springs are thereby to be dimensioned so that after release the internal diameter has become so great that the detonation charge carrier can be displaced freely in the direction of the percussion needle. Through the parameters spring length, spring strength, degree of tension, conditional upon the diameter of the cage and the pretreatment of the spring, and also through the rubbing of the band layers in respect of each other, the time, in which ignition may not result, can be set very precisely with simple means.

With the pre-barrel safety mechanism according to the invention, a rendering safe during transport, which is known per se, can also be realised in the simplest manner by securing the cage in an axial direction by means of a lateral locking pin.

If a disc-shaped permanent magnet with magnetization essentially in the disc plane is provided above and/or below the set spiral spring, rotation of the set of of springs is braked upon release. In this way the safety time can be extended.

The invention is represented in the drawing and is explained by way of example further in the following.

Figure 1 shows a section through the projectile head;

Figure 2 shows a top view of a set of springs;

Figure 3 shows a projectile head with magnetic brake;

Figure 4 shows a set of springs with corrugated end of the outermost spring.

Figure 1 shows a projectile head 1 with the pre-barrel safety mechanism according to the invention. The left half shows the safe position; in the right-hand half, the pre-barrel safety mechanism is thrown and the axially movable detonator percussion pellet 2 has struck against the percussion pin disc 4 on account of its inertia when striking against the percussion pin 3.

In the safe state, the set 6 of spiral springs surrounded by a cage 5 in the form of a circular ring, reaches so far into the chamber between percussion pin 3 and the front side of the detonator percussion pellet 2 that even with maximum accelerations is contact of the percussion pin 3 and the detonator percussion pellet 2 precluded on account of the rigidity of the set 6 of springs. In the left-hand part of the figure a locking pin 7 serving as a transportation safety mechanism can further be seen. As long as this pin 7 is not drawn out, the cage 5 cannot move even in the case of the greatest acceleration and therefore ignition is impossible. Before loading, the pin 7 is removed.

In the event of firing, on account of the acceleration, the cage 5 will slide backwards over the detonator percussion pellet 2. As soon as the set of springs is no longer surrounded by the cage 5, release of the wound-up set 6 of springs begins.

The set 6 of springs wound up from three individual springs 8, 9, 10 can be seen better in Figure 2. The inner dot-dash line 11 indicates the internal diameter of the cage 5 and substantially corresponds with the outer diameter of the detonator percussion pellet 2. The outer dot-dash line 12 reproduces the outer diameter of the cage 5 or the internal wall of the projectile head

and denotes the maximum available space into which the set of springs 6 can expand. The space is so great that in the released state of the set of springs 6 the inner approximately circular space 13 has become so great that the front part of the detonator percussion pellet 2 is allowed through.

In Figure 2 there is shown the situation where the cage 5 has just slid onto the detonator percussion pellet and release of the set of springs 6 commences. The beginning 14 of the spring 8 rests externally against the wall 12 on the projectile and the rest of the set 6 of springs endeavours to unwind along the wall 12 of the newly developed larger free space in a rotating manner. The set 6 of springs rotates with increasing speed of rotation, but still with closed inner wound core as far as the end of the spring length 8.

The springs 9, 10, which are still tightly wound at this moment, rotate with such high speed - that initially no unwinding of the central 9 and inner 10 spring lengths is possible, because the central spring length 9 must first change its direction of rotation for the purpose of unwinding. Only after stopping of rotation of the set 6 of springs can the upper layer of the central winding 9 be loosened from the still fixed remaining spring assembly. Unwinding of the central spring 9 follows, as the spring, as in the case of the outer winding length 8, is applied outwardly against the released spring 8 and begins to rotate in the opposite direction. The innermost spring 10 remains firmly tensioned until the set of springs comes to a stop anew and the beginning of the spring 10 resting against the expanded spring 9 begins to be released and to rotate.

At the end of the release, the end of the spring 10 rests quite close, on the inside, against the annular set of springs which has enlarged in diameter and the central opening 13 is so great that even the spring 10 can no longer hinder the axial movement of the detonator percussion pellet 2.

The time which passes until the narrow set 6 of springs has expanded to form a larger set of springs which is also again annular, depends upon various quantities and can be adjusted very easily. The length, the tensional force and the friction of the band layers with respect to each other are important. The release and thus also the rotation of the set of springs can be braked magnetically in an advantageous manner, the result of this being a lengthening of the safety time.

A safety device with a magnetic brake is represented in Figure 3. In the left-hand half, as in Figure 1, the safe state is represented; the right-hand half shows the state on impact: the percussion pin 3 has, on braking, penetrated the detonator percussion pellet 2, which has moved forwards. The parts are denoted by the same reference numerals as in Figure 1. The percussion pin disc 4 is here bent upwards a little. It accommodates a permanent magnet as an annular disc 15. It is magnetized such that the direction of magnetization essentially runs in the annular plane and the two poles are formed on the disc such that they lie opposite each other and the lines of force run mainly perpendicular to the spiral springs of the set 6 of springs.

In Figure 4 a somewhat modified set 6 of springs is represented. The beginning 16 of the outermost spiral spring 8 is shown to be corrugated. As a result the outermost winding of the spiral spring is prevented from being able to slip between cage and detonator percussion pellet during the process in which the cage is drawn off the set of spiral springs.



Claims

1. . Pre-barrel safety mechanism on a projectile
with percussion fuse by means of a multi-part band
winding assembly, in which the individual windings are
5 wound up, in each case, in opposite directions and
which, in the safety state, keeps two parts of a
detonating train, which can be moved relative to each
other, at a distance from each other and also frees
their movement in the state of safety take-off,
10 characterised in that in the case of a non-spin
projectile the winding is formed as spiral springs (8,
9, 10) and in the safety state is surrounded by a cage
(5) which can be displaced in the event of discharge,
in which case after freeing of the spiral spring
15 assembly (6) by the cage (5) the unwinding process
occurs in such a way that in the first instance the
outermost spiral spring (8) is released progressively
from the outside inwards and thereby sets the remaining
spring assembly (6) into rotation and when there is a
20 change-over to the next outer spiral spring (9) of the
remaining spring assembly (6) and the latter is
released stoppage and subsequent reversal of the
rotation of the respectively remaining spring assembly
(6) result.

25 2. Pre-barrel safety mechanism according to
claim 1, characterised in that the spiral spring
assembly (6) consists of three spiral springs (8, 9,
10).

30 3. Pre-barrel safety mechanism according to
claim 1 or 2, characterised in that a magnetized plate
(15) is present above/below the spiral spring assembly
(6).