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MECHANICAL DETONATOR

Helmut Junghans, Sulgen, near Schramberg, Germany

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3 Claims. (Cl. 102—39)

This invention relates to mechanical detonators having a barrel safety means for rifled projectiles, and it is the primary object of the invention to provide a detonator of this kind which is suitable more particularly for projectiles of extremely small calibre, but which will operate in perfectly reliable fashion despite the very small dimensions which are then required.

An important feature of the invention consists in the fact that the safety means comprises gripper arms, which are arranged in cage-like fashion and are capable of swinging outwards and which engage in locking fashion with the ignition element by means of inwardly directed abutments, being held for such time in the locking position by the forces of inertia of the ignition element until the forces of inertia have disappeared, so that the centrifugal force then takes effect and the gripper arms are able to swing outwards. The inwardly directed radial abutments on the gripper arms preferably engage in hook-like fashion with a plate of comparatively large diameter provided on the ignition element.

Owing to the fact that in addition to the resiliency possessed by the gripper arms or imparted thereto by separate springs substantially the forces of inertia of the ignition element act on the hook-like abutments it is ensured that the safety means cannot be released so long as the forces of inertia are effective, that is to say—so long as effective action is exerted by the sudden impulse imparted to the single parts of the projectile upon the firing of the gun.

Since this impulse is still effective when the projectile has already left the barrel, the safety means cannot be released prematurely, more particularly when the projectile is still within the barrel. Since furthermore the actuation of the safety means and the release of the ignition element will only occur when the requisite centrifugal force causes the gripper arms to swing outwards, the safety means also cannot be released when the projectile is shaken, jolted or subjected to other appreciable concussion, for example during transport or the like, i. e., when the projectile is not acted upon by forces tending to turn the same about its axis.

An additional object of the invention is so to construct the detonator and the single parts that it may be produced in ready and simple fashion, but at the same time in the case of projectiles of small calibre may be assembled readily and in effective form despite the small dimensions involved. For this purpose an inner member covered by the nose of the detonator is furnished with an annular groove, which is engaged by the gripper arms by means of transverse members arranged at their front ends so that the gripper arms are enabled to swing outwards. Particular hinge portions accordingly do not require to be produced and assembled, and the gripper arms are suspended solely in the said annular groove in the inner member by their front ends and the transverse members provided thereon. The inner member may also be furnished with longitudinal grooves which are adapted to be engaged by the gripper arms and the resilient arms of a spring cage placed over the same.

The detonator thus constructed having the barrel safety means with the features referred to possesses in its interior, despite the small dimensions concerned, sufficient space to enable the connection between the percussion head and the firing pin to be passed through the centre of the detonator. If desired there may even also be provided a time fuse.

A form of embodiment of the invention is illustrated in the accompanying drawing.

Fig. 1 is a side view of the assembled fuse.

Fig. 2 is a longitudinal section through the detonator, and

Fig. 3 is a perspective part-view of one of the gripper arms with the resilient cage.

The detonator casing *e* surrounds an inner member *d*, which is held by a bottom plate *f* screwed into the casing *e*. In the nose of the casing *e* there is located in known manner the percussion head *g*, which is connected with the firing pin *c* by means of an axially guided rod *h*. The firing pin *c* possesses a disc or plate *i* of comparatively large diameter. In the inner member *d* there is provided an annular groove *k*, this inner member also having four longitudinal grooves *l*. The annular groove *k* is engaged by transverse members *m* provided at the front ends of the gripper arms *b*, which are provided at the lower ends with inwardly directed radial abutments *n* engaging below the plate *i*. The longitudinal portions of the arms *b* rest in the longitudinal grooves *l*, in such fashion that they are able to swing outwards under the action of centrifugal force. The gripper arms are normally held radially inwards by means of a spring cage *a*, the arms of which each engage with a gripper arm *b*.

The operation of this safety device is as follows: So long as the projectile is in the stationary condition the parts assume the positions shown in Fig. 1, that is to say—the firing pin *c* is locked by the abutments *n* on the gripper arms so that it cannot move downwards against the

cap. Even a powerful blow or jolt is unable to produce any variation in this condition.

When the projectile is fired forces of inertia are initially brought about, which tend to force the firing pin *c* with the plate or disc *i* downwards. In this manner the plate or disc *i* also presses forcibly against the abutments *n* on the arms *b* and prevents these arms from swinging out even if the centrifugal force were sufficient in itself to cause the arms to move outwards. It is not until the projectile has covered a certain distance during which the forces of inertia have entirely or practically entirely disappeared that the centrifugal force is able to act sufficiently strongly on the ends of the gripper arms loaded by the abutments *n* to cause these arms to swing out to sufficient extent to release the plate or disc *i*. When then the projectile strikes its object the firing pin *c* is driven into the cap by the percussion head *g* by way of the rod *h*, and the ignition is thus brought about. If desired there may also be provided in the inner space left by the cage-like safety means a divided fuse, which also acts on the plate *i* and accordingly on the firing pin, but is likewise secured by the safety means described.

What I claim as new and desire to secure by Letters Patent is:

1. A mechanical detonator for projectiles comprising a detonator casing, a detonator base having screw-threads to receive the casing thereon; and a safety device comprising an inner member fitting in the casing and held in place by the base, said inner member being provided with an annular groove, a plurality of gripper arms, said inner member having longitudinal grooves therein in each of which a gripper arm is provided and in which the arms swing, a transverse member for each gripper arm fitting in the annular groove, and a spring cage provided over the inner member and adapted to press the arms inwardly by spring pressure, said spring cage comprising spring members for each gripper arm, said spring members normally fitting within the longitudinal grooves of the inner member.

2. A mechanical detonator for projectiles comprising an ignition element, a disc on said element, and means dependent on the inertia of the projectile to permit axial movement of the disc comprising a plurality of gripper arms which are adapted to swing outwardly from the ignition element on bearings at one end in the vicinity of the head of the detonator under the action of centrifugal force, and a radial abutment on the other end of each gripper arm forming abutment surfaces on which the disc rests which are at right angles to the axis of the ignition element and which in the normal position contact the under side of the disc to solely hold the ignition element but when the propectile is fired the inertia will maintain the arms in contact with the disc and prevent the arms from swinging outwardly and when the forces of inertia have ceased to act the centrifugal force on the gripper arms will cause the abutments to move radially without forward movement thereby freeing the disc to permit movement of the ignition element to detonating position.

3. A mechanical detonator according to claim 2, in which the ignition element is in the form of a firing pin which upon movement is brought directly to the detonating substance.

HELMUT JUNGHANS.