Dec. 12, 1939. G. HÖNGER 2,183,073

SAFETY DEVICE FOR PROJECTILE FUSES

Filed June 28, 1938 2 Sheets-Sheet 1

Fig. 1.

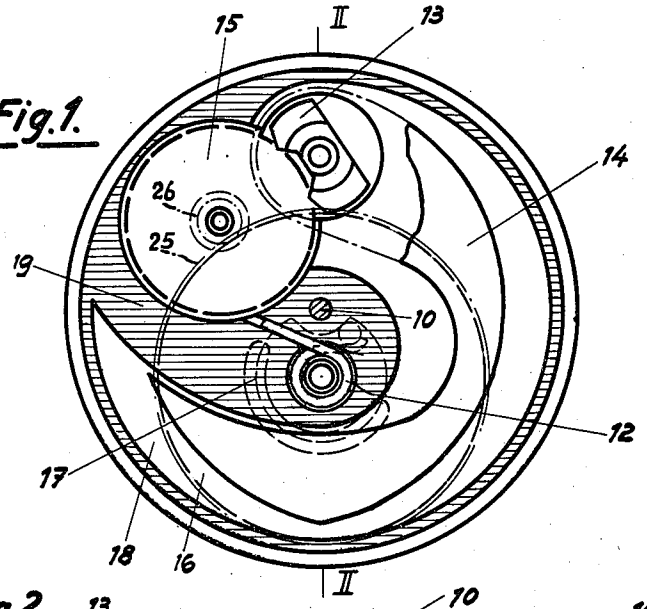


Fig. 2.

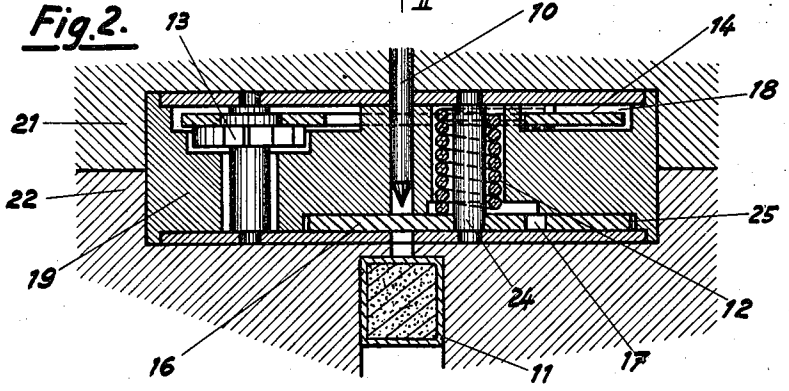
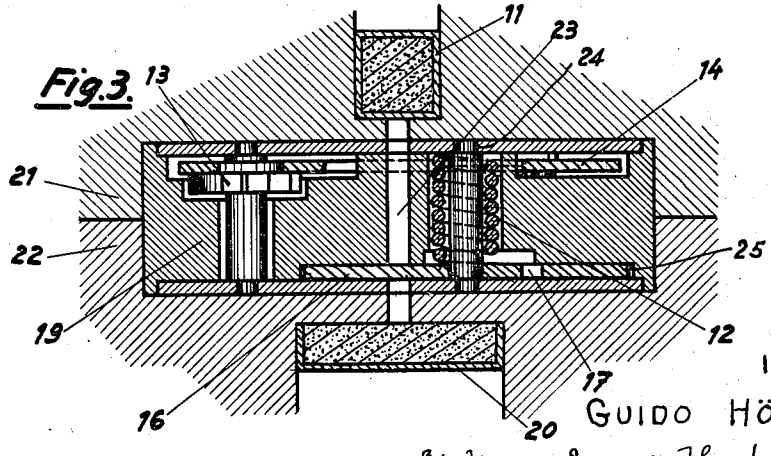


Fig. 3.



INVENTOR
GUIDO HÖNGER
By Young, Emery & Thompson
ATTYS

Dec. 12, 1939. G. HÖNGER 2,183,073

SAFETY DEVICE FOR PROJECTILE FUSES

Filed June 28, 1938 2 Sheets-Sheet 2

Fig. 4.

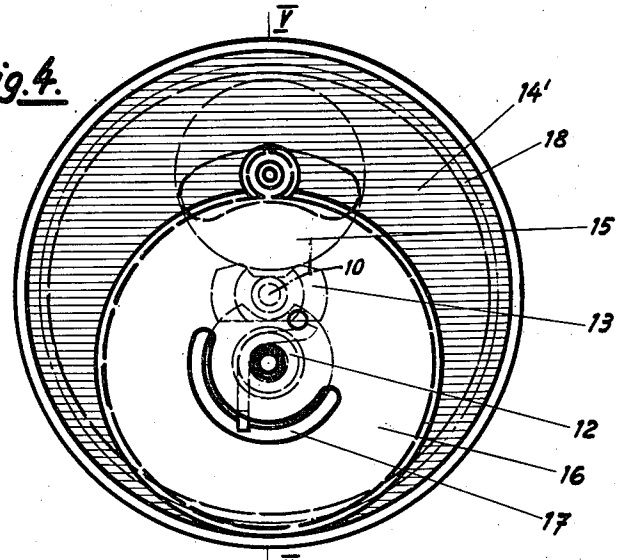
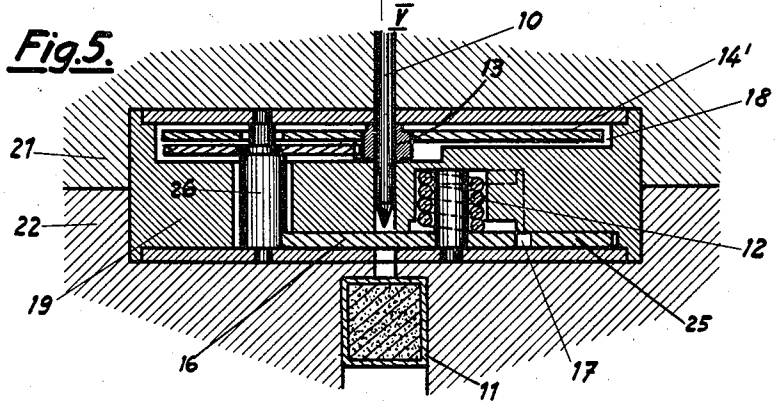


Fig. 5.



INVENTOR

GUIDO HÖNGER

By Young, Emery & Thompson

ATTYS.

Patented Dec. 12, 1939 2,183,073

UNITED STATES PATENT OFFICE

2,183,073

SAFETY DEVICE FOR PROJECTILE FUSES

Guido Hönger, Geneva, Switzerland, assignor to Mifina S. A., Binningen, Switzerland, a corporation of Switzerland

Application June 28, 1938, Serial No. 216,403
In Switzerland June 30, 1937

9 Claims. (Cl. 102—36)

This invention relates in general to projectile fuses and more particularly has reference to a clockwork controlled safety device.

The use of clockwork in projectile fuses to control or to directly actuate safety means of all kinds is generally known, as is also the use of spring force as a drive in such fuse clockwork mechanisms.

On the other hand, difficulties are encountered in meeting the requirements for extremely inexpensive, simple, and at the same time small clockwork of great precision of operation, whereby in hand grenades, for example, of given dimensions and weights, there will be available a maximum space for the explosive charge, these requirements being mutually contradictory.

In view of these requirements, the attempts of manufacturers have been directed to provide clockwork which will be loaded as little as possible by the operations which it has to perform, whereby clockwork of small dimensions and of small driving torque can be used, and also to enable the precision of operation of the clockwork to be as great as possible.

The object of the present invention is to provide a supplementary safety means, completely independent of all the usual safety means present in projectiles, which supplementary safety means comes into action only when for any reason the course of the firing operation does not proceed normally—that is, in the prescribed manner. This safety means consists of a device which permits the ignition of the bursting charge only at and during an exactly predetermined time, independently of other safety means, and without influencing the ignition means or being influenced by such means as long as the projectile explodes at the desired time and place. In all normal cases in which the safety means does not have to operate, there is therefore no interference whatever with the ignition means.

The safety means according to this invention consists of a closure member not influenced by the ignition means and driven by a clockwork, which closure means, for example, blocks the path of the firing pin to the detonator, or obstructs the firing channel between the detonator and the bursting charge at a suitable point, and which leaves said pin or channel free for operation only at and during a predetermined time calculated from the instant of beginning of projectile flight.

Several constructions of the safety means according to the present invention are illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a plan and partial sectional view of a device according to the present invention.

Fig. 2 is a vertical sectional view on line II—II of Fig. 1.

Fig. 3 is a vertical section similar to Fig. 2 of a modification.

Fig. 4 is a plan view, partly in section, of another modification.

Fig. 5 is a sectional view on line V—V of Fig. 4.

Similar reference characters denote corresponding parts in all the figures of the drawings.

The clockwork mechanism of the present invention enclosed in a body 19 is adapted to be mounted in the usual manner between two parts 21 and 22 of a fuse body. As shown in Figs. 1 and 2, a rotatable closure member 16 is mounted to close or block the path of a firing pin 10 to prevent contact of the latter with a cap 11. Closure member 16 is rotated during operation of the mechanism by a helical spring 12 surrounding the spindle 24 of the member 16, one end of the spring being anchored to the body 19 of the clockwork and the other end being secured to the member 16.

Gear teeth 25 are provided on the periphery of member 16 and mesh with the teeth of a pinion 26 fixed on a common shaft with an escapement wheel 15. A rocker 13 of the clockwork escapement cooperates with the escapement wheel 15. A sickle-shaped rocking lever 14 is fixed to the rocker 13 and swings in a cavity 18 of the body 19. Closure member 16 has an arcuate-shaped opening 17 of suitable size for the purpose of permitting the ignition of the bursting charge during a predetermined time.

The operation is as follows:

The clockwork mechanism, preferably wound up during the assembly of the fuse, is secured in any known manner against premature operation. At the instant of firing of the projectile, the clockwork is released by a safety means (not illustrated), and the clockwork and closure member 16, which heretofore by its position rendered ignition on the brusting charge impossible, start motion at a speed determined only by the strength of the spring 12 and the characteristics of the escapement, said movement being also independent of the ballistic factors of the projectile. By this movement of the closure member 16, there is produced after a certain time, which can be determined arbitrarily at the time of manufacture, a shifting of the opening 17 into a position providing a free path for the firing

pin 10, which free path is preserved during a time which can also be freely determined in the manufacture of the mechanism.

If, during this period, corresponding to the length of the opening 17, ignition does not take place for any reason, for example, due to failure of other safety devices, then the closure member will again obstruct the path of movement of the firing pin so that a subsequent undesired explosion of the projectile is impossible.

This re-locking of the firing pin, which cannot be released from outside, possesses a great value, particularly in the case of hand grenades, since it prevents any non-exploded grenades thrown back by the enemy, doing damage to friendly troops.

In the modification according to Fig. 3, the closure member 16, instead of obstructing the path of movement of a firing pin, obstructs a fire channel 23 between a cap 11 and a detonator 20.

It is clear that in the special case where re-locking is not desired, the opening 17 must be made such that the path of the firing pin to the detonator must still remain open after complete running down of the clockwork. This corresponds to the special case in which the predetermined period of opening is endless. In similar manner, it can be arranged that the firing channel in the modification of Fig. 3 can be kept permanently opened at the end of a predetermined time calculated from the launching of the projectile.

As regards the drive of the clockwork for actuating the safety device, this can be effected in known manner by spring power, and in the case of projectiles with spin motion, it can be effected by centrifugal force.

In the construction according to Fig. 4, the firing pin 10 also serves as the shaft of the escapement 13, the rocking lever in this case having the form of a circular disc 14'.

A special shaping of the rocking lever, for example, as shown in Figs. 1 and 4, is important in order that notwithstanding small dimensions of the clockwork, long periods of rocking with small amplitude of rocking can be obtained. These requirements are the more important, since the mechanical work which can be stored in a relatively small driving spring, without appreciable time fatigue, is also very small, so that it is necessary for the number of escapement oscillations during the whole running period of the clockwork to be very few.

It is obvious that the herein described constructions and details may be modified without departing from the invention. For example, the closure member, instead of being rotary, may have a straight line motion.

The herein described safety means according to the invention has the great advantage of being independent of the speed of flight of the projectile, of rotation of the projectile, and in particular independent of the ballistic factors, and it provides a re-locking mechanism which will make projected, but not destroyed, projectiles safe to handle. Obviously, it can be used in all fuses, whether impact or time fuses, or artillery weapons, aerial bombs, hand grenades, or projectiles of trench mortars, since the safety means according to the present invention operates entirely separately from all other safety means.

I claim:

1. In a projectile fuse having a path for access to a bursting charge, a clockwork actuated safety device comprising a closure member interposed in and closing said path for preventing access to said bursting charge, said closure member having an opening therein, means for displacing said closure member through a position wherein the opening will register with said path to permit access through said path to the bursting charge to a position wherein the path will again be closed, and clockwork mechanism for timing the displacement of said closure member.

2. In a projectile fuse having a path for access to a bursting charge, a clockwork actuated safety device comprising a rotatable disc-like closure member interposed in and closing said path for preventing access to said bursting charge, said closure member having an opening therein adapted to register with said path when said closure member is rotated to a predetermined position, a spring for rotating said closure member through the position wherein the opening registers with said path to a position wherein said path is again closed, and clockwork mechanism for timing the rotation of said closure member.

3. In a projectile fuse having a detonator and a firing pin, a clockwork controlled safety device comprising a closure member interposed in and blocking the path of travel of the firing pin between the detonator and firing pin, said closure member having an opening therein, means for displacing said closure member to and through a position to permit access of the firing pin to the detonator through said opening to a position to again block said path, and clockwork mechanism for controlling the displacement of said closure member.

4. In a projectile fuse having a detonator and a firing pin, a clockwork controlled safety device comprising a rotary closure member interposed in and blocking the path of travel of the firing pin between the detonator and firing pin, said rotary closure member having an opening therein adapted to register with the path of travel of the firing pin when the closure member is in a predetermined position, means for rotating said closure member to and through said predetermined position to a position again blocking said path, and clockwork mechanism for controlling the rotation of said member.

5. In a projectile fuse having a detonator and a firing pin, a clockwork controlled safety device comprising a rotary closure member interposed in and blocking the path of travel of the firing pin between the detonator and firing pin, said rotary closure member having an opening therein adapted to register with the path of travel of the firing pin when the closure member is in a predetermined position, means for rotating said closure member to and through said predetermined position to a position again blocking said path, an escapement wheel, means for transmitting rotation of the closure member to the escapement wheel, an escapement rocker associated with the escapement wheel, and a sickle-shaped rocking lever carried by said rocker.

6. In a projectile fuse having a detonator and a firing pin, a clockwork controlled safety device comprising a rotary closure member interposed in the path of travel of the firing pin between the detonator and firing pin, said rotary closure member having an opening therein adapted to register with the path of travel of the firing pin when the closure member is in a predetermined position, means for rotating said closure member to and through said predetermined position to a position again blocking said path, a cylindrical clockwork casing, said rotary closure member being mounted

eccentrically in said casing, and escapement wheel, means for transmitting rotation of the closure member to the escapement wheel, an escapement rocker mounted eccentrically of and adjacent the periphery of the casing, said casing having a free space opposite the rocker, and a sickle-shaped rocker lever mounted on said rocker and having its blade-like portion extending into said free space.

7. In a projectile fuse having a detonator and a firing pin, a clockwork controlled safety device comprising a rotary closure member interposed in and blocking the path of travel of the firing pin between the detonator and firing pin, said rotary closure member having an opening therein adapted to register with the path of travel of the firing pin when the closure member is in a predetermined position, means for rotating said closure member to and through said predetermined position to a position again blocking said path, a cylindrical clockwork casing, said rotary closure member being mounted eccentrically in said casing, an escapement wheel, means for transmitting rotation of the closure member to the escapement wheel, and an escapement rocker mounted on the firing pin.

8. In a projectile fuse having a detonator and a firing pin, a clockwork controlled safety device comprising a rotary closure member interposed in and blocking the path of travel of the firing pin between the detonator and firing pin, said rotary closure member having an opening therein adapted to register with the path of travel of the firing pin when the closure member is in a predetermined position, means for rotating said closure member to and through said predetermined position to a position again blocking said path, a cylindrical clockwork casing, said rotary closure member being mounted eccentrically in said casing, an escapement wheel, means for transmitting rotation of the closure member to the escapement wheel, an escapement rocker mounted on the firing pin, and a circular disc-like rocker lever carried by said rocker.

9. In a projectile fuse, a detonator, a cap, a fire channel between said detonator and cap, a clockwork actuated safety device comprising a closure member interposed in said fire channel for closing the same, a spring for displacing said closure member to and through a position to open said channel to a position to again close said channel, and clockwork mechanism for timing the displacement of said closure member.

GUIDO HÖNGER.