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Hand grenade fuse

The invention relates to a hand grenade fuze having a firing cap, a delay charge, which can be fired by the firing cap, in a delay charge holder, a detonator, which can be fired by the delay charge, in a detonator holder, and a booster charge, which can be fired by the detonator, for firing a hand grenade explosive charge.

Hand grenade fuzes such as these are known from the prior art. In this case, firing of the firing cap results in the delay charge being fired. The detonator holder is fixed on the delay charge by means of a soldered connection. During the burning of the delay charge, the soldered connection is released, and the detonator holder is moved by the force of a stressed spiral spring such that the detonator, which is contained in the detonator holder, is positioned in an insert. When the detonator is fired by a flame jet originating from the burning delay charge, the detonation of the detonator results in the insert being knocked through, and the booster charge which is covered by the insert being fired.

A certain level of safety is ensured for this hand grenade fuze in that detonation of the detonator when the detonator holder is in the position secured by the soldered connection does not result in the insert being knocked through, and therefore does not result in the

booster charge being fired. However, this hand grenade fuze has the disadvantage that firing of the firing cap, even when this is not intended, for example as a result of the influence of heat, produced in an open flame, always leads to the booster charge being fired, and therefore to the hand grenade explosive charge being fired.

In the case of grenades which have been fired by a launching apparatus, it is normal practice to provide a safety element to enhance safety, which safety element is made inoperable only by a defined force, which occurs during launching, for example a rotational force. A force defined in this way is, however, not available for use of a hand grenade. Electronic safety elements which are also known from the prior art for hand grenades are expensive to manufacture. Furthermore, their long-term reliability is questionable.

The object of the present invention is to provide a cost-effective hand grenade fuze which offers better safety against inadvertent activation than the mechanical hand grenade fuzes described above. One particular aim is for inadvertent firing of the firing cap not to automatically lead to firing of the booster charge. The firing cap is fired inadvertently, for example, in the event of a so-called "fast cook off", in which the hand grenade is subjected to an open fire. A further aim is to provide a hand grenade having a fuze such as this.

The object is achieved by the features of Claims 1 and 10. Expedient refinements result from the features of Claims 2 to 9.

According to the invention, a hand grenade fuze is provided having a firing cap, a delay charge, which can be fired by the firing cap, in a delay charge holder, a

detonator, which can be fired by the delay charge, in a detonator holder, and a booster charge, which can be fired by the detonator, for firing a hand grenade explosive charge. The detonator holder is in this case
5 designed such that it can pivot. The delay charge holder, which is arranged in a first position, blocks a pivoting movement of the detonator holder in a rest position. In the rest position, the detonator is not arranged in line with the booster charge and the delay
10 charge, such that burning of the delay charge cannot fire the detonator, and detonation of the detonator cannot fire the booster charge. The delay charge holder is held in the first position by a connection which can be released by heat. The connection which can be
15 released by heat may, for example, be a plastics connection, although it may also be wax or an adhesive connection. A combination of plastics, wax and/or adhesive is also possible. The connection which can be released by heat is arranged such that burning of the
20 delay charge results in the connection which can be released by heat being released and, under the influence of a force action, for example from at least one stressed spring, results in the delay charge holder assuming a second position, with the blocking of the
25 pivoting movement of the detonator holder being cancelled, thus resulting in the detonator holder being pivoted from the rest position to an activation position. (The force action can also be produced by a pressure, in particular a gas pressure, instead of by
30 means of the at least one stressed spring). As a result of this, the detonator is arranged in line with the booster charge and the delay charge such that the detonator is fired by the burning of the delay charge, and the detonation of the detonator which results from
35 this fires the booster charge. By way of example, once the blocking has been cancelled, the detonator holder can be pivoted by the force of a stressed spring.

Since there is no need to provide any safety separation between the detonator and an insert that has to be overcome by the detonation of the detonator for the hand grenade fuze according to the invention, the fuze
5 according to the invention can be considerably shorter than a conventional hand grenade fuze with the same cross section. Furthermore, the fuze according to the invention can be produced with less weight, fewer components and at lower cost than a conventional hand
10 grenade fuze.

However, the major advantage of the hand grenade fuze according to the invention is that inadvertent firing of the firing cap does not necessarily lead to the
15 complete sequence of the firing chain by burning of the delay charge, detonation of the detonator and firing of the booster charge. For this purpose, all that need be ensured is that the delay charge holder is secured in the first position such that, when the delay charge
20 burns, possibly even only temporary release of the connection which can be released by heat, as a result of the heat released during burning, does not lead to the delay charge holder being able to assume the second position. The blocking of the pivoting movement of the
25 detonator holder is thus maintained, and the burning delay charge cannot fire the detonator. The firing chain is thus interrupted. The hand grenade fuze according to the invention is therefore considerably safer than conventional hand grenade fuzes.

30 In one refinement of the invention, the delay charge holder is held together with a slide, which is also provided, in the first position by the connection which can be released by heat. In this case the slide is
35 arranged such that the release of the connection which can be released by heat results, under the influence of the force action, for example of a stressed spring, in the slide assuming a third position, wherein, as a result of the third position being assumed, the slide

causes the detonator holder to pivot from the rest position to the activation position. This design means that there is no need for a further spring for pivoting the detonator holder. The design of the hand grenade
5 fuze is thus further simplified. It can thus be produced even more advantageously.

The detonator holder may be essentially spherical. This allows the detonator holder to be mounted in a
10 particularly simple manner, cost-effectively, reliably, and such that it can pivot. "Essentially" in this case means that relatively minor deviations from the spherical shape are possible, which are used, for example, for engagement of the slide or for blocking of
15 the pivoting movement.

In a further refinement according to the invention, the detonator holder has an opening, particularly in the form of a channel, through which the detonator can be
20 fired by the burning delay charge. The provision of the opening makes it possible to further improve the safety of the hand grenade fuze according to the invention, because a flame jet, or a firing jet, originating from the delay charge, must impact precisely on the opening
25 in order to fire the detonator.

In the hand grenade fuze according to the invention, a supporting disc, which has an aperture, can be arranged on the delay charge holder between the detonator holder
30 and the delay charge holder. In this case, the detonator holder has a flat on which the supporting disc is held by the delay charge holder, in order to block the pivoting movement. The provision of the supporting disc means that a relatively large area of
35 the detonator holder is blocked in order to prevent the pivoting movement. This measure further improves the safety of the hand grenade fuze according to the invention. The aperture in the supporting disc is necessary in order that a flame jet which originates

from the burning delay charge can reach and fire the detonator through the aperture.

5 The connection which can be released by heat may be a soldered connection. This can be produced reliably and relatively cost-effectively.

10 In one refinement of the hand grenade fuze according to the invention, a hammer is also provided in order to strike the firing cap, and a secured grip is provided in order to hold the hammer in an initial position. In this case, the delay charge holder is secured in the first position by the grip or a safety element which is held by the grip, wherein the grip and, if present, the
15 safety element are/is designed such that removing the safety element and releasing the grip result in the safety of the delay charge holder being cancelled. This refinement reliably prevents the hand grenade from being fired inadvertently when the grip is secured.
20 Even firing of the firing cap and of the delay charge does not result in the detonator and the booster charge being fired, because the delay charge holder cannot leave the first position, even if the connection which can be released by heat is released by the burning of
25 the delay charge. However, when the hand grenade is correctly armed and thrown, and the grip is thus released, the delay charge holder can assume the second position, and can result in a serviceable firing chain being produced.

30 The hammer can be mounted such that it can pivot. Furthermore, a stressed torsion spring can be provided which, when the safety element is removed and the grip is released, results in the hammer striking the firing
35 cap in a pivoting movement, and firing it.

The grip and, if present, the safety element and/or the hand grenade fuze can be designed such that removing the safety element and releasing the grip result in the

grip and, if present, the safety element being released from the hand grenade fuze. A refinement such as this can be provided without any problems by a person skilled in the art. For example, the grip may be a
5 mount in the form of a half shell, which is pressed against an opposing bearing by a spring. When there is no spring force because of the grip having changed position when the hand grenade is thrown, a grip such as this would cease to be held on the opposing bearing,
10 and would be released from the hand grenade fuze.

The invention also relates to a hand grenade having a hand grenade fuze according to the invention.

15 The invention will be explained in more detail in the following text with reference to one exemplary embodiment and the drawings, in which:

Figure 1 shows a hand grenade fuze according to
20 the prior art,

Figure 2 shows a hand grenade fuze according to the invention with a grip,

25 Figure 3 shows a hand grenade fuze according to the invention when the hammer strikes the firing cap,

Figure 4 shows a hand grenade fuze according to
30 the invention during burning of the delay charge, immediately after the connection which can be released by heat has been released, and

35 Figure 5 shows a hand grenade fuze according to the invention having a detonator holder, which has been pivoted to the activation position, shortly before the latter is fired by the delay charge.

In the case of the hand grenade fuze according to the prior art, as illustrated in Figure 1, removal of the optional safety clip 1 and of the safety pin with the ring 3 first of all results in the protective shroud 18 no longer being held, as a result of which the protective shroud 18 falls off. Once the grip 6 is released, the hammer 4, which is arranged such that it can pivot, is moved over by the force of the prestressed torsion spring 2. During the process, the grip 6 is released. The hammer strikes the firing cap 16 and thus fires it.

The fired firing cap 16 initiates the delay charge 13, which burns away within about 3.5 seconds, starting from the firing cap 16. As soon as the fire front in the delay charge reaches the solder point 20, the heat created by it unsolders the threaded ring 14. The force of the stressed helical spring 5 then pushes the detonator holder 11 as far as the stop which is formed by the insert 19, while the delay charge holder 12 remains in the same position. A flap valve 8 is thus released, which is held closed until then by the detonator 10. When the fire front reaches the constriction pan 7, which is arranged at the lower end of the delay charge holders and has two apertures, the constriction pan produces a firing jet, in the direction of the detonator, pushing the flap valve 8 open. The firing jet bridges the gap to the detonator 10, and fires the detonator. When the detonator is fired, it strikes through the insert 19 and thus fires the booster charge 9, which then in turn fires a hand grenade explosive charge, which is not illustrated here.

This fuze also leads to detonation of the hand grenade when the firing cap 16 is fired inadvertently, for example by the entire hand grenade being severely heated. The hand grenade fuze according to the

invention, as shown in Figure 2, prevents this. The reference signs in Figure 2 have the same meaning as the corresponding reference signs in Figure 1.

5 A supporting disc 21, which is arranged on the delay charge holder 12, is knocked through and is held by the delay charge holder 12 on a flat on the spherical detonator holder 11, prevents the detonator holder 11 from being able to carry out a pivoting movement.
10 Furthermore, a slide 23, a channel 24 in the detonator holder 11 and a fuze holder 25 which is a component of the grip 6 are provided. The safety clip 1 illustrated in Figure 1 is not shown in Figure 2. However, it is possible to provide a safety clip 1 in this design
15 also. The hand grenade fuze according to the invention operates correctly as follows:

After the safety pin with the ring 3 has been removed, the protective shroud 18 falls away. Once the grip 6 is
20 released, the change in the position of the hammer 4 which is produced by the torsion spring 2 causes the grip 6 with the fuze holder 25 to be forced away. The hammer 4 strikes the firing cap 16 and results in it being fired, as a result of which the delay charge 13
25 is initiated. This burns away starting from the firing cap. Figure 3 illustrates the situation shortly before the fire front in the delay charge 13 reaches the solder point 20.

30 Figure 4 shows the situation after the fire front of the delay charge 13 has passed the solder point 20 and has caused the threaded ring 14 to be unsoldered. In consequence, the stressed helical spring 5 moves the entire delay charge holder 12 in the direction of the
35 hammer 4. A gap is therefore opened between the supporting disc 21 and the detonator holder 11, cancelling the blocking of a pivoting movement of the detonator holder 11 by the supporting disc 21 being held on the flat 26 on the detonator holder 11. The

slide 23 is also moved in the direction of the detonator holder 11 by the force of the stressed helical spring 5, thus resulting in a pivoting movement of the detonator holder 11.

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Figure 5 shows the situation at the end of the burning away of the delay charge 13 shortly before the firing of the detonator 10 in the detonator holder 11, which has in the meantime been pivoted to the activation position. Further burning away of the delay charge results in the creation of a firing jet, which fires the detonator through the aperture in the supporting disc 21 and the channel 24. The firing of the detonator results in the firing of the booster charge, which in turn fires the hand grenade explosive charge, which is not shown here.

If the firing cap 16 is not fired correctly, this does not lead to firing of the booster charge, and therefore also does not lead to firing of the hand grenade explosive charge. The firing sequence described above is thus interfered with in this case in that, when the firing sequence is not correct, the grip 6 with the fuze holder 25 is still in its original position in the situation illustrated in Figure 2, thus preventing the delay charge holder 12 from changing its position. The supporting disc 21 is thus held on the flat 26 on the detonator holder 11, preventing the detonator holder from pivoting to an active position. This is also the case if the solder point 20 is unsoldered by firing of the firing cap 16 and of the delay charge 13. No flame jet originating from the delay charge 13 reaches the detonator. The flame jet is passed into a sleeve 27 which surrounds the hand grenade fuze. If the detonator were nevertheless to be fired after some time because of the heat developed, the energy released during the detonation is likewise bypassed into the sleeve, and therefore does not reach the booster charge 9.

Furthermore, the safety of the hand grenade fuze according to the invention is improved in that the detonator 10 cannot be fired directly by the firing cap 16 when there is no delay charge 13 present or the
5 delay charge 13 is faulty, because the detonator holder 11 is not pivoted to the activation position, because the threaded ring 14 is not unsoldered, as a result of the lack of the delay charge 13. The flame jet from the firing cap 16 is simply passed into the sleeve 27. This
10 is important in order that the hand grenade is not fired immediately, that is to say without any delay, if there is no delay charge 13 or the delay charge 13 is faulty.

List of reference symbols

1	Safety clip
2	Torsion spring
3	Safety pin with ring
4	Hammer
5	Helical spring
6	Grip
7	Constriction pan
8	Flap valve
9	Booster charge
10	Detonator
11	Detonator holder
12	Delay charge holder
13	Delay charge
14	Threaded ring
15	Sealing ring
16	Firing cap
17	Housing
18	Protective shroud
19	Insert
20	Solder point
21	Supporting disc
22	Detonator holder mount
23	Slide
24	Channel
25	Fuze holder
26	Flat
27	Sleeve

Patent Claims

1. Hand grenade fuze having a firing cap (16), a
5 delay charge (13), which can be fired by the firing cap
(16), in a delay charge holder (12), a detonator (10),
which can be fired by the delay charge (13), in a
detonator holder (11), and a booster charge (9), which
can be fired by the detonator (10), for firing a hand
10 grenade explosive charge,

characterized

in that the detonator holder (11) is designed such that
it can pivot, and the delay charge holder (12), which
is arranged in a first position, blocks a pivoting
15 movement of the detonator holder (11) in a rest
position, in which the detonator (10) is not arranged
in line with the booster charge (9) and the delay
charge (13), such that burning of the delay charge (13)
cannot fire the detonator (10), and detonation of the
20 detonator (10) cannot fire the booster charge (9),
wherein the delay charge holder (12) is held in the
first position by a connection which can be released by
heat, wherein the connection which can be released by
heat is arranged such that burning of the delay charge
25 (13) results in the connection which can be released by
heat being released and, under the influence of a force
action, for example from at least one stressed spring,
results in the delay charge holder (12) assuming a
second position, with the blocking of the pivoting
30 movement of the detonator holder (11) being cancelled,
thus resulting in the detonator holder (11) being
pivoted from the rest position to an activation
position, as a result of which the detonator (10) is
arranged in line with the booster charge (9) and the
35 delay charge (13), in that the detonator (10) is fired
by the burning of the delay charge (13), and the
detonation of the detonator (10) which results from
this fires the booster charge (9).

2. Hand grenade fuze according to Claim 1,
characterized

in that the delay charge holder (12) is held together
with a slide (23), which is also provided, in the first
5 position by the connection which can be released by
heat, wherein the slide (23) is arranged such that the
release of the connection which can be released by heat
results, under the influence of the force action, in
the slide (23) assuming a third position, wherein, as a
10 result of the third position being assumed, the slide
(23) causes the detonator holder (11) to pivot from the
rest position to the activation position.

3. Hand grenade fuze according to one of the
15 preceding claims,

characterized

in that the detonator holder (11) is essentially
spherical.

20 4. Hand grenade fuze according to one of the
preceding claims,

characterized

in that the detonator holder (11) has an opening,
particularly in the form of a channel (24), through
25 which the detonator (10) can be fired by the burning
delay charge (13).

5. Hand grenade fuze according to one of the
preceding claims,

30 **characterized**

in that a supporting disc (21), which has an aperture,
is arranged on the delay charge holder (12) between the
detonator holder (11) and the delay charge holder (12),
wherein the detonator holder (11) has a flat (26) on
35 which the supporting disc (21) is held by the delay
charge holder (12), in order to block the pivoting
movement.

6. Hand grenade fuze according to one of the preceding claims,

characterized

in that the connection which can be released by heat is
5 a soldered connection.

7. Hand grenade fuze according to one of the preceding claims,

characterized

10 in that a hammer (4) is also provided in order to strike the firing cap (16), and a secured grip (6) is provided in order to hold the hammer (4) in an initial position, wherein the delay charge holder (12) is secured in the first position by the grip (6) or a
15 safety element which is held by the grip (6), wherein the grip (6) and, if present, the safety element, are/is designed such that removing the safety element and releasing the grip (6) result in the safety of the delay charge holder (12) being cancelled.

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8. Hand grenade fuze according to Claim 7,
characterized

in that the hammer (4) is mounted such that it can pivot, and a spring, in particular a stressed torsion
25 spring (2) or a helical leg spring, is provided which, when the safety element is removed and the grip (6) is released, results in the hammer (4) striking the firing cap (16) in a pivoting movement, and firing it.

30 9. Hand grenade fuze according to Claim 7 or 8,

characterized

in that the grip (6) and, if present, the safety element and/or the hand grenade fuze are/is designed such that removing the safety element and releasing the
35 grip (6) result in the grip (6) and, if present, the safety element being released from the hand grenade fuze.

10. Hand grenade having a hand grenade fuze according to one of the preceding claims.