

DESCRIPTION

Activation unit for explosive masses or explosive bodies

5

The invention relates to an activation unit for, in particular, munition-free explosive masses or explosive bodies, for example for forming decoys.

10 Decoys and/or smoke shells based, for example, on red phosphorus (RP) or nitrocellulose (NC) are used in military applications, for example smoke shells, infrared (IR)-acting aircraft decoys etc. The smoke or IR effect is deployed by the RP/NC after appropriate
15 ignition by burning. RP units (explosive bodies) are ignited via an ignition or break-up charge, which ensures that the bodies can be optimally ignited, and can then burn, for the respective purpose.

20 DE 10 2007 032 112 A1 describes so-called jamming which are fired from a launching apparatus having a plurality of launching tubes. Launching is performed in a manner initiated electrically or mechanically. The sub-
25 clocking for initiating the individual light flashes is controlled by an electronics system which is incorporated in the apparatus. A plurality of sub-bodies are ignited in a manner clocked in time in order to initiate the light flashes or break-up flashes. To this end, said sub-bodies have pyrotechnic ignition or
30 break-up charges.

DE 199 10 074 B4 describes a launching apparatus for firing a plurality of explosive bodies. The explosive bodies which can be fired in this case each have a
35 drive charge with an ignition means, for example a firing cap, which is connected to a control unit of the adapter when the explosive-body pack and adapter are in the assembled state.

Decoys of this kind cannot be used in civil aviation because of the munition component since explosives are not accepted in this context and international safety agreements etc. have to be complied with.

Proceeding from the above, a novel ignition concept has been developed, this concept not requiring explosive and/or pyrophoric substances to ignite RP/NC flares.

10

This novel ignition concept is described in more detail in DE 10 2006 004 912 A1. Said document discloses a system for protection, in particular, of large flying platforms, such as aircraft, against a threat guided by IR or radar. In this case, the explosive bodies are preferably activated or ignited contactlessly. The explosive bodies are then ejected pneumatically or mechanically. The explosive bodies themselves are munition-free packs which are ignited by means of hot air or a laser.

20

Building on this activation, the invention is based on the object of specifying an activation unit which activates such explosive bodies in order to produce decoys.

25

The object is achieved by the features of patent claims 1 and 7. Advantageous embodiments can be found in the dependent claims.

30

Fundamentally, the invention is based on the above-mentioned idea of activating (of igniting) the explosive masses/flare material by supplying thermal energy. This avoids the use of explosives.

35

In order to activate the explosive body, said explosive body is thus subjected to the action of thermal energy in a suitable form. This can be achieved by the explosive body, which generally comprises individual

flares, being forced through an ignition tube for activation purposes. The "ejection" can be performed pneumatically or mechanically.

- 5 To this end, an ignition tube, from which the explosive masses are ejected, has a high-temperature activation element which consists essentially of n heating elements which are arranged geometrically separately from one another, radially around the circumference of
10 an ignition tube. The geometry of the activation unit is not necessarily a circular cylinder. The heating elements can also be matched to other geometries, for example to a rectangular cylinder.
- 15 The material chosen for the individual heating elements allows temperatures of $> 600^{\circ}\text{C}$, with the heating elements being designed such that they allow extremely dynamic heating on account of small masses. The outer casing of the heating wire of the heating elements is
20 preferably composed of a highly temperature-resistant steel with a high CrNi content. Furthermore, ceramic inlays, for example, ensure further thermal optimization by minimizing heat losses. The heating elements are designed such that they ensure ideal
25 energy input into the explosive body for the application. The heating element can additionally be provided, for example, with contact plates or the like for improved energy transfer. This thermal optimization and appropriate control engineering result in an
30 extremely short reaction time of the heating elements, that is to say the heating time from the switch-on point to reaching the nominal temperature is extremely short (low or small).
- 35 Any desired number of heating elements may be used and may be selected, and the heating elements may in principle be prefabricated in any shape. It is therefore possible to ideally set the energy input for each application on the one hand by the choice of the

number n of heating elements and/or on the other hand by adapted control engineering.

Depending on the application, the explosive body can be
5 ignited by contact with the heating elements or else contactlessly. To this end, it is possible to activate the explosive body as it "flies past".

This form of activation allows the use of decoys
10 without explosives in the civil environment, not only in civil aviation but also for civil seaborne targets and land vehicles. The design and safety requirements for decoys and dispensers without explosives are simpler, that is to say considerably less stringent.
15 The ignition unit or apparatus allows a multiplicity of ignition operations, while that for traditional flares is intended to be used only once.

The extremely high CrNi content results in a high
20 susceptibility to corrosion, the high temperature resistance and a relatively high wear resistance. The separate casing and routing of the elements ensures the leaktightness of the heating elements. The casing is free of potential, and traditional short-circuit links
25 are therefore excluded. It is likewise possible to adapt the power to a slight extent by changing the length or simply changing the circuitry of the heating elements. The functional reliability can be increased by current preferably being carried in multiple
30 circuits through the n heating elements. The contactless and flexible suspension/incorporation of the heating elements permits only low levels of loss and improved contact-making. The explosive-body tolerances could be better compensated for by clean
35 routing of the explosive-body pack.

Practice has shown that ignition over a large surface area (surface area of approximately 80%) is achieved

with a low mass (and therefore with a minimal thermal inertia for ensuring dynamic heating regulation).

5 The invention will be explained in more detail with reference to an exemplary embodiment and a drawing, in which:

- 10 fig. 1 shows an activation unit with an ejection tube for an explosive body,
- fig. 2 shows heating elements of the activation unit from fig. 1,
- 15 fig. 3 shows a variant of the design of the ejection tube,
- fig. 4 shows a further embodiment of the ejection tube, and
- 20 fig. 5 shows an explosive body which is to be dispatched from the ejection tube.

In the section illustrated in fig. 1, 1 denotes an activation unit. The high-temperature activation unit 1
25 substantially comprises an ejection tube 2 from which an explosive body 3 (fig. 5), which is not illustrated in any more detail here, is ejected in the direction of the arrow P. The ejection tube 2 is surrounded by high-temperature heating elements 4 on its inner
30 face/surface, with each individual element 4 being formed from a heating wire 6 which is held in a casing 7, protected against external influences, and is preferably embedded in a material which minimizes heat loss, preferably in a ceramic inlay 8. In the preferred
35 embodiment, the outer casing 7 of the heating element 4 is composed of a highly temperature-resistant steel with a high CrNi content. For mechanical strain relief, the ceramics 8 are held in the metal structure of the ejection tube 2, with the metal structure corresponding

to the external shape of the explosive body 3, in this case a cylindrical shape. Alternative forms are likewise possible.

5 The heating wires 6 are supplied by appropriate control engineering (not illustrated in any more detail) with the appropriate electrical energy, and are thus heated to $> 600^{\circ}\text{C}$. The ceramic inlays 8 themselves improve the energy balance of the respective heating element 4, and
10 in the process ensure more efficient introduction of energy from the explosive body 3.

Fig. 2 shows a variant of the arrangement and of the design of heating element 4 which is embedded in the
15 ceramic inlay 8.

Figure 3 shows a further variant of the activation unit 1' with an ejection tube 2'. In this figure, 10 denotes heating elements which are routed along through the
20 tube 2' and have a CrNi steel casing 11, the heating wire surface of said tube being increased in size by at least one, for example soldered-on, contact plate 13, as a result of which the contact area of the heating wire 14 relative to the explosive body 3 is also
25 increased in size. The ejection tube 2' has a thermal insulation means 15, for example formed by one/several ceramic inlay(s).

Fig. 4 shows another embodiment of the activation unit
30 1'' having an ejection tube 2''. In this embodiment, short heating elements 10'' are used similarly to those above.

Fig. 5 shows the design of the explosive body 3. Said
35 explosive body is distinguished by a plurality of individual flares 9.

The functioning is as follows:

5 The explosive body 3 is forced through the activation unit 1 (1', 1''), by way of example, by a plunger (eject unit - not illustrated in any more detail). When the explosive body 3 passes through the activation unit 1, the casing surface of the explosive body 3 makes contact with the individual elements 4 of the activation unit 1. The thermal energy is transferred
10 (directly or indirectly) through the heating wires 6 (14) to the explosive body 3 which is ignited at the touching or contact points. After emerging from the activation unit, the explosive body 3 can burn through completely, and can develop its radiation (IR
15 radiation).

As already mentioned, as an alternative to making direct contact, contactless activation is also possible, in which case it is necessary to ensure that
20 the individual flares 9 of the explosive body 3 are ignited.

PATENT CLAIMS

1. An activation unit (1) for munition-free explosive
5 masses or explosive bodies (3), characterized by an
ejection tube (2) and high-power heating elements (4)
which are fitted in the ejection tube (2) and in each
case consist of at least one heating wire (6) which,
for its part, is supplied with electric current by a
10 regulation unit.

2. The activation unit as claimed in claim 1,
characterized in that each heating wire (6) is held in
a casing (7).
15

3. The activation unit as claimed in claim 2,
characterized in that the casing (7) is a highly
temperature-resistant steel with a high CrNi content.

20 4. The activation unit as claimed in one of claims 1
to 3, characterized in that the respective heating wire
(6) is embedded at least in a material which minimizes
heat loss.

25 5. The activation unit as claimed in claim 4,
characterized in that the material is a ceramic inlay
(8).

30 6. The activation unit as claimed in one of claims 1
to 5, characterized in that the heating elements (4)
are held in the ceramics (8) for mechanical strain
relief in a metal structure of the ejection tube (2),
wherein the metal structure corresponds to the
respective external shape of the explosive body (3).

35 7. The activation unit (1', 1'') for munition-free
explosive masses or explosive bodies (3), characterized
by an ejection tube (2', 2'') and heating elements (10,

10') which are longitudinally routed at least partially through the ejection tube (2', 2'') in the ejection tube (2', 2'') and comprise heating wire (14), which is sheathed (11) with CrNi steel, and contact plates (13) which are soldered onto said heating wire.

8. The activation unit as claimed in claim 7, characterized in that the heating elements (10) are routed along through the entire length of the ejection tube (2').

9. The activation unit as claimed in claim 7 or 8, characterized in that the ejection tube (2', 2'') has a thermal insulation means (15), for example formed by one/several ceramic inlay(s).

10. The activation unit as claimed in claim 9, characterized in that the thermal insulation means (15) is incorporated on the inner surface of the ejection tube (2', 2'') between the sheathed heating wires (14) and the ejection tube (2', 2'').