

DESCRIPTION

Activation Unit for Munition-Free Decoys

5 Decoys and/or smoke shells based, for example, on red phosphorus (RP) or nitrocellulose (NC) are used in military applications, such as smoke shells, infrared (IR)-acting aircraft decoys etc., in order to spontaneously cover an area with hot particles, in
10 order for example to mask a thermal image. The carrier is in this case broken up with the aid of a central fuze charge. During break-up, a flame front and a pressure front are formed, which on the one hand distribute the pyrotechnic films over an area, and on
15 the other hand produce a flame front which ignites the pyrotechnic films. The smoke or IR effect is developed by the RP/NC after appropriate ignition by burning. The RP units (active bodies) are ignited via an ignition or break-up charge, which ensures that the bodies can be
20 optimally ignited, and can then burn, for the respective purpose.

At the moment, Class 1 break-up systems are used to produce these massive pyrotechnic effects. This results
25 in a very high classification of the active system and prevents use for protection, for example, of civil aircraft, since it is forbidden to carry Class 1 substances/appliances in aircraft such as these. Such decoys cannot be used in civil aviation because of the
30 munition component, since explosives are not accepted in this context, and International Safety Agreements, etc. must be complied with.

Because of this, a novel ignition concept has been
35 developed which does not require explosive and/or pyrophoric substances to ignite RP/NC flares.

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This novel ignition concept is described in more detail in DE 10 2006 004 912 A1. This 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 active bodies are preferably activated or ignited contactlessly. The active bodies are then ejected pneumatically or mechanically. The active bodies themselves are munition-free packs which are ignited by means of hot air or a laser.

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

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

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

For this purpose, in a first embodiment, an ignition tube, from which the active 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 an ignition tube. The material chosen for the individual heating elements allows temperatures of more than 600°C, with the heating elements being designed such that they allow extremely dynamic heating, because the masses are small. Ceramic inlays are provided in order to minimize heat losses and in order to further thermally optimize the activation unit. This thermal optimization and

appropriate control engineering result in an 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
5 (low or small).

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
10 therefore possible to ideally set the energy introduction 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.

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

20 This form of activation allows the use of decoys 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
25 simpler, that is to say considerably less stringent. The ignition unit or apparatus allows a multiplicity of ignition operations, while that for traditional flares is intended to be used only once.

30 The second solution principle is represented by a preferably conically tapering tubular connecting stub which can be heated to the specific temperature and by means of which the films with a pyrotechnic coating, or a comparable coating which can be ignited, are ignited
35 during axial relative movement. The coated films are ignited in the tubular connecting stub, and leave it burning.

During relative movement of the coated polygonal films in the heated tubular connecting stub, their corners slide along the connecting stub length and are ignited by the heat transfer produced in the corners touching the tubular connecting stub.

The tapering profile is therefore a preferred embodiment to ensure the ignition. The contact area between the coated film and the (conical) tubular connecting stub increases continuously during relative movement, and therefore enhances the functional reliability.

The (conical) tubular connecting stub can be heated both electrically and by a burner, etc.

The active signature starts without delay for the ejection of the coated films, and enhances the effectiveness of the protection system.

The coated films are preferably designed with a specific polygonal geometry. The functional reliability of the ignition increases in proportion to the number of corners of the coated films.

The coated films can be deployed individually or else in layers in a pack, which considerably enhances the effectiveness of the protection system. Radial rotation of the coated films is irrelevant to their effectiveness.

The advantages of this system are, in addition to the very high functional reliability with a low failure rate, little maintenance effort, low costs and adequate safety during transportation and in operation. This is achieved by the coated films being accelerated in a separate acceleration system, which is at the same time decoupled from the heat, before the heated tube or

tubular connecting stub. The coated films can be accelerated mechanically (for example by a spindle drive), pneumatically (for example by compressed air) or else pyrotechnically.

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

10 Figure 1 shows an activation unit with an ejection tube for an active body,

Figure 2 shows heating elements of the activation unit from Figure 1,

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Figure 3 shows an active body to be fed out of the ejection tube,

20 Figure 4 shows a conically tapering tubular connecting stub, as a basic unit of the ignition process, and

Figure 5 shows a geometrically preferred illustration of a further flare.

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In the section illustrated in Figure 1, 1 denotes an activation unit. The high-temperature activation unit 1 essentially consists of an ejection tube 2 from which an active body 3 (Figure 3), which is not illustrated in any more detail, is ejected in the direction of the arrow P. The ejection tube 2 is surrounded by high-temperature heating elements 4, 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. For mechanical strain relief, these ceramics 8 are held in the metal structure of the ejection tube 2,

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with the metal structure corresponding to the external shape of the active body 3, in this case a cylindrical shape.

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 more than 600°C. The ceramic inlays 8 themselves improve the energy budget of the respective heating
10 element 4, and in the process ensure more efficient introduction of energy from the active body 3.

Figure 2 shows a variant of the arrangement and of the design of the heating elements 4.

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Figure 3 shows the design of the active body 3, which is distinguished by a plurality of individual flares 9.

The function is as follows:

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By way of example, the active body 3 is forced through the activation unit 1 by a plunger (eject unit - not illustrated in any more detail). When the active body 3 passes through the activation unit 1, the casing
25 surface on the active body 3 makes contact with the individual elements 4 of the activation unit 1. The thermal energy is transferred (directly or indirectly) through the heating wires 6 to the active body 3 or to the individual flare 9, which is ignited at the
30 touching or contact points. After emerging from the activation unit, the active body 3 can burn through completely, and can develop its radiation (IR radiation).

35 As already mentioned, as an alternative to making direct contact, contactless activation is also possible, in which case it is necessary to ensure that

the individual flares 9 (11) of the active body 3 are ignited.

In Figure 4, 10 denotes a preferably conically tapering tubular connecting stub (activation unit 10) with a heating element of a deployment system 12 (also referred to as an ejection system) for the active body 3 or the individual flare 9. The tubular connecting stub 10 has a first, front internal diameter D_{IR-2} as well as a second, rear internal diameter D_{IR-1} , as well as a length L . The deployment system 12 furthermore has an acceleration unit 13 and insulation 14 in order to provide thermal decoupling between the ignition unit and acceleration unit 13. The second internal diameter D_{IR-2} is in this case equal to the diameter of the insulation 14 and of the acceleration unit 13. P denotes the axial movement direction of the film or of the flare 11.

Figure 5 shows a further variant, in which a flare 11 is a polygonal, coated flare. The number of corners E should be greater than three. The diagonal D_F between the corners E is in this case greater than the rear internal diameter D_{IR-1} . The first internal diameter D_{IR-2} is itself greater than or equal to the diagonals D_F . The corners E slide during relative movement – in the direction P – in the heated tube 10 along the length L and are ignited by the heat transfer produced in the corners E which make contact with the tubular connecting stub 10. Subject to the condition described above, the contact area between the coated film 11 and the correspondingly conical tubular connecting stub 1 increases continuously during relative movement.

In order to ensure adequate ignition, the films or individual flares 11 (9) could, for example, have corners/side edges which can be bent over (also partially), via which the heat transfer likewise takes

place when the film is accelerated along the inner wall of the tube or tubular connecting stub.

PATENT CLAIMS

1. An activation unit (1, 10) for munition-free active masses or active bodies (3) or flares (9, 11)
5 for the protection of aircraft against heat-seeking threats, characterized by a heat transfer within the activation unit (1, 10) by heating elements (4), wherein the activation unit (1, 10) is formed by an ejection tube (2) and high-power heating elements (4)
10 which are fitted around the ejection tube (2), and the heating elements (4) each consist of at least a heating wire (6), which is itself supplied with electric current by a regulation unit.
- 15 2. The activation unit as claimed in claim 1, characterized in that each heating wire (6) is held in a casing (7).
3. The activation unit as claimed in claim 1 or 2,
20 characterized in that the respective heating wire (6) is embedded at least in a material which minimizes heat loss.
4. The activation unit as claimed in claim 3,
25 characterized in that the material is a ceramic inlay (8).
5. The activation unit as claimed in one of claims 1 to 4, characterized in that the heating elements (4)
30 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 active body (3).
- 35 6. The activation unit as claimed in one of claims 1 to 5, characterized in that the active bodies (3) or flares (9, 11) can be accelerated mechanically, pneumatically or pyrotechnically.

7. The activation unit as claimed in one of claims 1 to 6, characterized in that the tubular connection stub (10) has a conically tapering shape.

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8. The activation unit as claimed in one of claims 1 to 7, characterized in that the tubular connecting stub (1) can be heated electrically and by a burner.

10 9. An active body (3), fired through an activation unit as claimed in one of claims 1 to 8, characterized in that the active body (3) is formed from individual flares (9, 11).

15 10. The active body as claimed in claim 9, characterized in that the individual flares (9, 11) are coated.

20 11. The active body as claimed in claim 9 or 10, characterized in that the flares (11) are polygonal.

12. The active body as claimed in claim 11, characterized in that the number of corners (E) is greater than two.

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13. The active body as claimed in claim 11 or 12, characterized in that the diagonal (D_F) between the corners (E) is greater than the rear internal diameter (D_{IR-1}), and the first internal diameter (D_{IR-2}) is itself
30 greater than or equal to the diagonals (D_F).

14. The active body as claimed in claim 9, 10 or 11, characterized in that the individual flares 9, 11 are corners/side edges which can be bent over.