

DESCRIPTION

Active element and method for igniting an active element

The invention relates to an active element, in particular a decoy active element, comprising at least one active substance and at least two ignition means, each comprising a pyrotechnic composition for igniting the active substance.

Furthermore, the invention relates to a method for igniting an active element.

Active elements, such as decoy active elements, are used in aviation. Since approximately 1970, such decoy active elements have been provided under a protective film or in a container and initiated from one side. This applies in particular to all conventional MTV (Magnesium Teflon-Viton) decoy active elements and spectral decoy active elements.

The ignition chain is activated from the firing side, preferably via a fail-safe system, for the active elements, which are preferably elongate in the case of aircraft, and then ignites the active element after release. These active elements often have a fast-burning coating composition in order to achieve ignition from all sides in the required time.

Decoy active elements having specific active substances and geometries are subject to ignition problems due to the design and the type of use, which can lead to delayed and reduced power delivery in the initial phase of the initiation.

The initiation usually takes place from an ignition side in the base region, which the so-called end face of the active element and runs through said element on the inside or on the outside along the surface in the direction of the ejection side, in order finally to achieve a reaction of the active element on all sides.

The ignition problems outlined above can have a direct impact on the effectiveness with respect to danger during the ignition phase.

The document DE 10 2009 030 871 A1 discloses an active element comprising a combustible active substance container based on plastics film, which can be ignited inductively, by means of a laser or by high temperature.

DE 10 2016 122 740 A1 discloses a pyrotechnic active element comprising a housing, an ignition device and at least one active composition. The ignition device is arranged, for example, in the bottom of the active element.

Patent application DE 10 2010 030 869 A1 discloses an active element comprising a plurality of active substances, which has a plurality of individual flares which are arranged one behind the other and can be ignited inductively, by means of a laser or by high temperature.

DE 10 2009 030 872 A1 relates to an active element which is inductively ignited, consisting of individual flares which are packed in a carrier material such as a steel foil coated with red phosphorus.

An encapsulated active element which has a large number of individual components for an infrared decoy and provides a central longitudinal ignition is known from DE 10 2010 013 110 A1.

DE 10 2004 047 231 A1 discloses a generic active element which has a plurality of active substances and ignition means. How the ignition is carried out and how the ignition means are arranged is not disclosed.

Depending on the basic material and the geometry of the active element, there may be no suitable approved or reliable coating composition which can be used for implementation as a military active element. A change in the active substance composition or geometry is not possible without restrictions due to existing systems, and there is therefore a conflict of goals in this case.

Furthermore, ignition from all sides or from a plurality of sides cannot be guaranteed without a coating composition.

Proceeding from this, the problem addressed by the invention is that of providing an active element which makes quick and reliable ignition of a plurality of active substances possible.

This problem is solved by the active element of claim 1. Furthermore, this problem is solved by the method of claim 13. Advantageous embodiments and developments are the subject matter of the respective dependent claims.

According to the invention, an active element, in particular a decoy active element, is provided, comprising at least one active substance and at least two ignition means, each comprising a pyrotechnic composition for igniting the at least one active substance. The at least two ignition means are arranged on the at least one active substance and the at least two ignition means are

connected to one another via channels in such a way that the at least one active substance can be ignited simultaneously from a plurality of sides.

Furthermore, according to the invention, a method is provided for igniting such an active element of this kind or as described below. The active element comprises at least one active substance and at least two ignition means, each comprising a pyrotechnic composition for igniting the active substances. The at least two ignition means are arranged on the at least one active substance and the at least two ignition means are connected to one another via channels in such a way that the at least one active substance can be ignited simultaneously from a plurality of sides.

According to the invention, it is therefore proposed to design the active element in such a way that it can be initiated, i.e. ignited, on a plurality of sides, but on at least two sides, for example on the lateral surfaces and on the opposite side. It is therefore an active element having multi-point ignition.

The at least one active substance is preferably at least one pyrotechnic active substance, such as is used in flares.

The channels are preferably ignition channels, which are designed to ignite the ignition means or conduct ignition to the ignition means. The channels can be arranged symmetrically and/or asymmetrically with respect to one another.

Simultaneously on a plurality of sides means that the active element or the at least one active substance can be ignited simultaneously at a plurality of points, such as sides, top, bottom or edges. Within the meaning of the invention, simultaneously means that the at least one active substance can be ignited substantially without time delay.

Within the meaning of the invention, the ignition means are, for example, squibs, smaller ignition-sensitive pyrotechnic compositions or other known ignition means.

As a result of the multi-sided ignition according to the invention, less sensitive active substances over a large area can be quickly and reliably ignited by significantly smaller ignition means.

Since a plurality of ignition means is provided, there is an improvement in the reliability of the ignition as a result of this redundant provision of the ignition means.

Furthermore, such an active element has a confusion effect on all sides immediately after being ejected (for example from an airplane) and approaching missiles can be reliably averted.

In addition, in particular due to the fact that the at least one active substance can be ignited from a plurality of sides simultaneously, a reduced scattering behavior and improved responsiveness during use are achieved by means of the active element according to the invention. In addition, the effectiveness of the active element is improved.

In an advantageous development of the invention, it can be provided that a plurality of, preferably each, of the active substances of the active element can be ignited simultaneously from a plurality of sides.

The at least two active substances can be of the same size and/or different sizes. By means of a large number of different active substances, it is possible to set the wavelength of the spectrum emitted by the active element during the combustion of the active substances.

In an advantageous development, the active element has at least two active substances and the ignition means are arranged between the active substances of the active element in such a way that the at least two active substances can be ignited simultaneously from a plurality of sides.

This ensures that each of the active substances of the active element is ignited reliably and simultaneously, and the active element produces a good confusion effect on all sides.

Furthermore, the ignition means can advantageously be arranged inside and/or outside the active element.

The pyrotechnic composition of the ignition means and the at least one active substance can furthermore be separated from one another by an inert material.

As a result, a defined separation of the at least one active substance from the pyrotechnic composition of the ignition means is achieved. This prevents the active substance and the pyrotechnic composition from chemically influencing one another during storage of the active element. Furthermore, this prevents unwanted ignition. In addition, this means that a defined ignition energy is required in order to ignite the body.

In an embodiment, the at least one active substance and/or the ignition means can also be separated from one another by a film, a housing or an air gap. The individual active substances can preferably be separated from one another in this way.

Such a physical separation can be achieved, for example, by a film or a housing made of paper, plastics material or metal.

In addition, it can be provided that the active element has grooves, slots and/or bores. The channels extend in the grooves, slots and/or bores. The individual active substances are preferably separated by these grooves and/or slots. However, it is also possible for the grooves, slots and/or bores to extend inside an active substance.

The provision of grooves, slots and/or bores predetermines the positioning of the channels and also ensures that the channels do not or only slightly protrude beyond the contour of the active element.

In a further development it can be provided that the grooves and/or slots extend in such a way that they intersect at a plurality of intersection points and the ignition means are formed at the intersection points.

The provision of such intersection points means that a plurality of active substances, for example four or eight, are provided at a distance from one another at an intersection point, and a plurality of active substances can thus be ignited at one point by an ignition means.

Furthermore, the grooves, slots and/or bores can be arranged inside and/or outside the active element.

In addition, the active element can be protected from environmental influences by a film or a housing. This ensures that the active element can be reliably ignited even at high wind speeds and/or ejection speeds, i.e., for example, when fired from a fast-flying flying device or aircraft.

Furthermore, according to the invention, it is possible for the active element to have no pyrotechnic coating composition coating the entire active element. Such a coating composition is a fast-burning composition which coats the active element and allows ignition from all sides. This has the advantage that the active element can be approved even if there is no suitable approved coating composition.

The ignition means can be arranged in such a way and the length of the channels can be formed in such a way that the ignition means can be ignited simultaneously.

The ignition means can also be connected to an ignition initiator via the channels.

In an embodiment of the method, a plurality of active substances of the active element can also be ignited simultaneously from a plurality of sides.

In an advantageous development, the active element can also be substantially cuboid and have substantially cuboid active substances. In this case, the active element can in particular be an active element for ammunition in the 2x1x8" or 1x1x8" NATO standard caliber.

However, the active element can also be a cylindrical active element, preferably having a diameter of 36 mm or 55 mm.

It is also possible for the active element to be spherical or triangular.

The invention will be explained below on the basis of an embodiment with reference to the drawings,

in which:

- Fig. 1 is a schematic perspective view of an active element according to the invention having channels according to a first embodiment;
- Fig. 2 is a schematic perspective view of the active element according to the invention according to the first embodiment of Fig. 1, the channels being hidden;
- Fig. 3 is a schematic perspective view of an active element according to the invention according to a second embodiment, the active element having internal channels;
- Fig. 4 is a schematic perspective view of an active element according to the invention according to a third embodiment, the active element having internal symmetrical and asymmetrical channels.

Fig. 1 is a schematic perspective view of an active element according to the invention 1. The active element 1 comprises a plurality of active substances $10_{1...n}$ and a plurality of ignition means $20_{1...n}$. The ignition means $20_{1...n}$ each comprise a pyrotechnic composition for igniting the active substances $10_{1...n}$.

Fig. 2 is also a schematic perspective view of the active element according to the invention according to Fig. 1, the channels $30_{1...n}$ being hidden.

The ignition means $20_{1...n}$ are arranged between the individual active substances $10_{1...n}$ and the ignition means $20_{1...n}$ are connected to one another via channels $30_{1...n}$ in such a way that the active element 1 can be ignited simultaneously from a plurality of sides.

The ignition means $20_{1...n}$ are connected to an ignition initiator (not shown) via the channels $30_{1...n}$, the ignition means $20_{1...n}$ being arranged and the length of the channels $30_{1...n}$ being formed in such a way that the ignition means $20_{1...n}$ can be ignited simultaneously.

As can be seen from Fig. 2, the active element 1 has grooves and/or slots $22_{1...n}$, by means of which the individual active substances $10_{1...n}$ are separated from one another. According to the first embodiment of Fig. 1 and 2, the grooves and/or slots $25_{1...n}$ are arranged inside the active element 1 and/or outside, i.e. externally.

The grooves and/or slots $22_{1...n}$ extend in such a way that they intersect at a plurality of intersection points $25_{1...n}$ and the ignition means $20_{1...n}$ are arranged at the intersection points $25_{1...n}$.

As shown in Fig. 1, the grooves and/or slots $22_{1...n}$ accommodate the channels $30_{1...n}$, i.e. the channels $30_{1...n}$ are arranged in the grooves and/or slots.

The individual channels $30_{1...n}$ are formed in a bead-like manner.

The individual active substances $10_{1...n}$ of the active element 1 can be ignited simultaneously from a plurality of sides.

According to the embodiment, the ignition means $20_{1...n}$ are arranged inside/outside the active element 1. For this purpose, said ignition means are provided in the slots/grooves of the active element 1.

The pyrotechnic composition of the ignition means $20_{1...n}$ and the active substances $10_{1...n}$ are separated from one another by an inert material. This can be designed, for example, as a film, a housing or an air gap.

According to Fig. 3, a schematic perspective view of an active element 1 according to the invention is shown according to a second embodiment which is based on the embodiment according to Fig. 1, and the differences are additionally shown below. The active element 1 has internal slots, grooves and/or bores $23_{1...n}$, in which channels $31_{1...n}$ are formed. The channels $31_{1...n}$ are formed inside the individual active substances $10_{1...n}$ and have a symmetrical pattern.

According to Fig. 4, a schematic perspective view of an active element 1 according to the invention is shown according to a third embodiment, which is based on the embodiment according to Fig. 3. In contrast to the embodiment according to Fig. 3, the internal channels $31_{1...n}$ are formed as symmetrical and/or asymmetrical channels $31_{1...n}$ inside the individual active substances $10_{1...n}$.

The embodiment shown in Fig. 1 to 4 is an active element 1 which comprises eight active substances 10_{1...8} and six ignition means 20_{1...6}. The active element 1 is substantially cuboid and comprises substantially cuboid active substances 10_{1...8}. In this case, the active element can in particular be an active element for ammunition in the 2x1x8" or 1x1x8" NATO standard caliber. However, this design of the above embodiment is merely an exemplary embodiment. A number other than eight active substances and six ignition means are also possible. However, the active element can also be a cylindrical active element, preferably having a diameter of 36 mm or 55 mm. It is also possible for the active element to be spherical or triangular.

List of reference signs

- 1 active element
- 10_{1...n} active substances
- 20_{1...n} ignition means
- 22_{1...n} slots, grooves and/or bores (internal)
- 23_{1...n} slots, grooves and/or bores (external)
- 25_{1...n} intersection points (internal)
- 26_{1...n} intersection points (external)
- 30_{1...n} channels (internal)
- 31_{1...n} channels (external)

Claims

1. Active element (1), in particular a decoy active element, comprising at least one active substance (10_{1...n}),
at least two ignition means (20_{1...n}), each comprising a pyrotechnic composition for igniting the active substances (10_{1...n}),
characterized in that
the at least two ignition means (20_{1...n}) are arranged on the at least one active substance (10_{1...n}) and the at least two ignition means (20_{1...n}) are connected to one another via channels (30_{1...n}, 31_{1...n}) in such a way that the at least one active substance (10_{1...n}) can be ignited simultaneously from a plurality of sides.
2. Active element (1) according to claim 1, characterized in that the active element (1) comprises at least two active substances (10_{1...n}) and the ignition means (20_{1...n}) are arranged between the active substances (10_{1...n}) of the active element (1) in such a way that the at least two active substances (10_{1...n}) can be ignited simultaneously from a plurality of sides.
3. Active element (1) according to claim 1 or claim 2, characterized in that the at least two ignition means (20_{1...n}) are arranged inside and/or outside the active element (1).
4. Active element (1) according to any of the preceding claims, characterized in that the pyrotechnic composition of each ignition means (20_{1...n}) and the at least one active substance (10) are separated from one another by an inert material.
5. Active element (1) according to claim 4, characterized in that the at least one active substance and/or the ignition means (20_{1...n}) are separated from one another by a film, a housing and/or an air gap.

6. Active element (1) according to any of the preceding claims, characterized in that the active element (1) has grooves, slots and/or bores (22_{1...n}, 23_{1...n}) by means of which the individual active substances (10_{1...n}) are separated and in which the channels (30_{1...n}, 31_{1...n}) extend.
7. Active element (1) according to any of the preceding claims, characterized in that the at least one active substance (10_{1...n}) has grooves, slots and/or bores (22_{1...n}, 23_{1...n}) in which the channels (30_{1...n}, 31_{1...n}) extend.
8. Active element (1) according to claim 6, characterized in that the grooves, slots and/or bores (22_{1...n}, 23_{1...n}) extend in such a way that they intersect at a plurality of intersection points (25_{1...n}, 26_{1...n}) and the ignition means (20_{1...n}) are formed at the intersection points (25_{1...n}, 26_{1...n}).
9. Active element (1) according to any of the preceding claims, characterized in that the grooves, slots and/or bores (22_{1...n}, 23_{1...n}) are arranged inside and/or outside the active element (1).
10. Active element (1) according to any of the preceding claims, characterized in that the active element (1) is protected from environmental influences by an inert film or a housing.
11. Active element (1) according to any of the preceding claims, characterized in that the active element (1) does not have a pyrotechnic coating composition which coats the entire active element (1).
12. Active element (1) according to any of the preceding claims, characterized in that the length of the channels (30_{1...n}, 31_{1...n}) is formed in such a way that the ignition means (20_{1...n}) can be ignited simultaneously.

13. Method for igniting an active element (1), in particular according to any of claims 1 to 12, comprising

at least one active substance (10_{1...n}),

at least two ignition means (20_{1...n}), each comprising a pyrotechnic composition for igniting the active substances (10_{1...n}),

characterized in that

the at least two ignition means (20_{1...n}) are arranged on the at least one active substance (10_{1...n}) and the at least two ignition means (20_{1...n}) are connected to one another via channels (30_{1...n}, 31_{1...n}) in such a way that the at least one active substance (10_{1...n}) can be ignited simultaneously from a plurality of sides.

14. Method for igniting an active element (1) according to claim 13, characterized in that a plurality of active substances (10_{1...n}) of the active element (1) are ignited simultaneously from a plurality of sides.