SUMMARY OF INVENTION

[0009a] According to a first aspect of the present invention, there is provided a method of creating a fragmentation pattern on a warhead, comprising:

ablating material from an interior surface of the warhead according to a pre-defined fragmentation pattern, wherein the pre-defined fragmentation pattern is effected with a mask.

[0009b] According to a second aspect of the present invention, there is provided a method of creating a fragmentation pattern on a warhead, comprising the steps of: applying to an interior surface of a warhead a stencil defining a fragmentation pattern and applying thereto a protective coating.

[0009c] According to a third aspect of the present invention, there is provided a method of creating a fragmentation pattern on an interior surface of a warhead, comprising the steps of depositing on the interior surface of the warhead and in an array defining a fragmentation pattern, with an additive manufacturing machine, otherwise known as a 3-D printer, an additive material sufficient to create a fragmentation stress raiser.

[0009d] According to a fourth aspect of the present invention, there is provided a method of creating a fragmentation pattern on a warhead, comprising ablating material from an interior surface of the warhead according to a pre-defined fragmentation pattern.

[0010] According to the present invention there is provided a method of creating a fragmentation pattern on a warhead comprising ablating material from the interior surface of the warhead according to a pre-defined fragmentation pattern. The pre-defined fragmentation pattern may be effected electronically or with a mask. The ablation may be effected by applying an etchant to the warhead interior surface material.

[0011] According to a feature of the claimed invention, a method for etching a fragmentation pattern into a warhead may comprise the steps of applying a photosensitive material coating, such as a photoresist, to an interior surface of a warhead casing, exposing a portion of the photosensitive material coating corresponding to the positive image of the fragmentation pattern to light radiation thereby curing the exposed portion of the photosensitive material coating, removing the unexposed portion of the photosensitive material coating with a photosensitive material removal process such as a chemical wash and applying an etchant material to the interior of the warhead casing thereby etching the negative image of the fragmentation pattern into the interior surface to create a sufficient differential natural stress raiser in the presence of an explosive blast wave.

[0012] According to another feature of the claimed invention, a method for creating a fragmentation pattern on a warhead comprises the steps of applying a photosensitive material resist coating, such as a photoresist, to an interior surface of a warhead casing, exposing a portion of the photosensitive material coating corresponding to the positive image of the fragmentation pattern to light radiation thereby curing the exposed portion of the photosensitive material coating, removing the unexposed portion of the photosensitive material coating with a photosensitive material removal process such as a chemical wash and depositing an additive stress protection material to the interior of the warhead casing thereby covering the cured positive image fragmentation pattern portion of the photosensitive material to create a sufficient differential natural stress raiser in the presence of an explosive blast wave.

CLAIMS

1. A method of creating a fragmentation pattern on a warhead, comprising:

ablating material from ~~the~~an interior surface of the warhead according to a pre-defined fragmentation pattern, wherein the pre-defined fragmentation pattern is effected with a mask.

2. The method as claimed in claim 1, wherein the mask is a stencil defining the fragmentation pattern.

3. The method as claimed in claim 2, wherein the stencil is an adhesive film.

4. The method as claimed in claim 1, wherein the mask is a silk screen defining the fragmentation pattern.

5. The method as claimed in claim 2 or 3, comprising the steps of: applying an additive protective material over a portion of the warhead interior surface; removing the stencil; coating the masked warhead interior with an etchant material and, when the etching is complete, removing the etchant material.

6. The method as claimed in any one of claims 1 to 4 and comprising applying an etchant resistant material to those portions of the interior surface of the warhead left exposed by the mask; removing the mask; coating the interior portion of the warhead with etchant and when etching is complete, removing the etchant.

7. The method as claimed in claim 6, wherein the etchant resistant material is applied via an applicator.

8. The method as claimed in claim 7, wherein the applicator applies the etchant resistant material in a liquid or solid phase via a spray or paint process.

9. The method as claimed in claim 6, wherein the etchant resistant material is coated to the said inner surface via a vapour, electrostatic or fused deposition process.

10. The method as claimed in claim 9, wherein the etchant resistant material is Halar ECTFE.

11. The method as claimed in claim 6, wherein the etchant resistant material is applied to the said inner surface via dipping.

12. The method as claimed in any one of claims 6 to 11, wherein after etching the etchant resistant material is also removed from the warhead.

13. A method of creating a fragmentation pattern on a warhead, comprising the steps of: applying to ~~the~~an interior surface of a warhead a stencil defining a fragmentation pattern and applying thereto a protective coating.

14. The method as claimed in claim 13, wherein the stencil has the thickness to impart a required stress raiser to the warhead.

15. The method as claimed in claim 1, wherein the mask is applied by an additive manufacturing machine, otherwise known as a 3-D printer, and comprises an etchant resistant material.

16. A method of creating a fragmentation pattern on ~~the~~an interior surface of a warhead, comprising the steps of depositing on the interior surface of the warhead and in an array defining a fragmentation pattern, with an additive manufacturing machine, otherwise known as a 3-D printer, an additive material sufficient to create a fragmentation stress raiser.

~~16~~17. A method of creating a fragmentation pattern on a warhead, comprising ablating material from ~~the~~an interior surface of the warhead according to a pre-defined fragmentation pattern.

~~17~~18. The method as claimed in claim ~~16~~17, comprising the steps of coating an additive protective material on the interior surface of a warhead and ablating said coating according to a desired fragmentation pattern.

~~18~~19. The method as claimed in claim ~~16~~17, comprising the steps of: coating the interior surface of a warhead with an etchant resistant material; selectively ablating etchant resistant material according to a desired fragmentation pattern; applying an etchant material thereover and removing the etchant material when etching is determined complete.

~~19~~20. The method as claimed in claim ~~17~~18 or ~~18~~19, wherein the ablation is effected with directed laser or water energy.

~~20~~21. The method of any one of the preceding claims and arranged to provide a rectangular, bow tie, helix, triangular or diamond shaped fragmentation pattern.

~~21~~22. The method of claim ~~51~~21 and wherein the resulting fragments have a maximum dimension of 3 to 10cm.