

CANDIDATE'S ANSWER

Response

Dear Sirs

I refer to the Communication issued under Art 94(3) EPC on the above-referenced application. I enclose herewith an amended claim set comprising claims 1 to 7 to replace the claims currently on file.

Amendments

Claim 1 has been amended to specify the following:

- i) the possibility that the slag forming agent can be a nitride has been deleted, i.e. the slag forming agent comprises, *inter alia*, a carbide of boron, aluminium or silicon.
- ii) the slag forming agent comprises hydrotalcite as a secondary slag forming agent.
- iii) the hydrotalcite is present in a weight ratio of 1:5 to 5:1 with respect to the carbide (and reference to a nitride has been deleted).
- iv) the fuel particles have a size of 5 to 80 µm.

Basis for these amendments can be found in previous claims 1, 3 and 4 for features i - iii listed above.

The deletion of "nitride" from claim 1 is allowable as previous claim 1 specified "carbide or nitride", i.e. these were two clear alternatives, such that the deletion of one alternative does not contravene Art 123(2) EPC.

Referring to feature ii listed above, this feature finds basis in previous claim 3, which is dependent on claim 1 and hence the incorporation of claim 3 into amended claim 1

does not contravene Art 123(2) EPC as previous claim 3 included all of the features of previous claim 1. Furthermore, paragraph [011] of the application as filed specifies that “when carbides are used as primary slag forming agents, hydrotalcites are very useful slag forming agents”. Thus there is clear basis in the application as filed for the combination of carbide slag forming agents and hydrotalcite as a secondary slag forming agent.

Referring to item iii listed above, the claimed ratio is disclosed in previous claim 4. Previous claim 4 was dependent on previous claim 3, which was itself dependent on previous claim 1. As such the combination of previous claims 1, 3 and 4 clearly finds basis in the application as filed. In addition, paragraph [016] of the application as filed specifies that if a secondary slag forming agent is present - as required by amended claim 1 - it must be added in a weight ratio of 1:5 to 5:1 with respect to the nitride or the carbide. The term “or” clearly denotes nitride and carbide as alternatives, and hence this combination of features does not contravene Art 123(2) EPC.

Referring to item iv listed above, paragraph [014] of the application as filed provides clear basis for this amendment. It is clear that paragraph [014] refers to the fuel particles of the previously described composition, and hence the incorporation of this features into amended claim 1 does not contravene Art 123(2) EPC.

New claim 2, specifying that the airbag composition of claim 1 further comprises a water-soluble polymer, finds basis at paragraph [012] of the application as filed. This paragraph refers to the composition generally, hence the combination of claim 2 and amended claim 1 does not contravene Art 123(2) EPC.

New claim 3 also finds basis at paragraph [012] of the application as filed, and does not contravene Art 123(2) EPC for the same reason as new claim 2 above.

New claim 4 finds basis at paragraph [015] of the application as filed. This paragraph refers to the oxidant generally, and hence new claim 4 does not contravene Art 123(2) EPC.

New claim 5 finds basis at para [010] of the application as filed. Carbides and nitrides are clearly presented as alternatives, i.e. para [010] clearly discloses the combination of nitrides and alkali metals or alkaline earth metals. As such this does not contravene Art 123(2) EPC.

Claim 6 has been amended to specify that the carbide and hydrotalcite are mixed first, followed by mixing with the rest of the ingredients. The deletion of “nitride” does not contravene Art 123(2) EPC as carbides and nitrides are presented as alternatives. This amendment is also in line with amended claim 1. This amendment finds basis at para [018] of the application as filed (“In case...are added”). This paragraph refers to “a secondary slag forming agent”, and para [011] clearly describes HTC as a secondary slag forming agent (“When carbides...agents.”) Para [018] also provides basis for the amendment that the pressing is for at least 5 minutes. It is clear that para [018] refers to the airbag composition generally, so these amendments do not contravene Art 123(2) EPC.

Claim 7 corresponds to previous claim 6. The dependencies have been amended accordingly.

Previous claim 2 has been deleted.

Previous claims 3 and 4 have been deleted and their subject matter, in part, incorporated into amended claim 1.

Novelty

The Examiner objects that claims 1-6 lack novelty over D1.

D1 discloses an airbag composition comprising a triazole or a tetrazole-type compound as fuel, an oxidant and a carbide or nitride as slag forming agent. D1 also discloses that oxides or hydroxides of aluminium can be added, and that “clays” can be used for the same purpose.

D1 does not disclose hydrotalcite as a secondary slag forming agent in its compositions. D1 also does not disclose hydrotalcite being present in a weight ratio of 1:5 to 5:1 with respect to the carbide. Both of these features are required by amended claim 1 of the present application.

The Examiner has correctly pointed out that D1 discloses “clays”. The generic disclosure of a composition comprising “clays” - a very broad class of compounds - does not destroy the novelty of a claim to a composition comprising HTC, which is a very specific form of clay (see para [011] of the present application), GL G-VI 5. Furthermore, amended claim 1 requires a 1:5 to 5:1 weight ratio of HTC to carbide. D1 does not disclose this ratio. D1 discloses a 1:1 ratio of titanium dioxide to carbide only. The 1:1 ratio is not disclosed in reference to clays.

Accordingly we submit that claim 1 is novel over D1.

Claims 2-7 are novel over D1 at least by dependency on amended claim 1. In addition D1 does not disclose the at least 5 minute pressing time of amended claim 6.

D2 discloses an explosive composition, used for the destruction of buildings, comprising tetrazole, strontium nitrate and HTC. The SiC and HTC are used in a 1:1 ratio.

D2 does not disclose a composition wherein the fuel particles have a size of 5 to 80 μm , as required by amended claim 1. D2 specifically discloses in para [002] that the fuel needs to be present as large particles, i.e. bigger than 1 mm. This is outside the range of amended claim 1. In addition para [014] of the present application specifies that fuel

particles outside the claimed 5-80 µm range are not suitable for use in airbags, and hence the composition of D2 cannot be considered to be airbag compositions.

Accordingly we submit amended claim 1 is novel over D2.

Amended claims 2-7 are also novel over D2 for at least the reason that they are dependent on novel claim 1. Furthermore, D2 does not disclose the at least 5 minute pressing feature of amended claim 6.

Accordingly we submit that amended claims 1-7 are novel over each of D1 and D2.

Inventive step

D1 is the closest prior art to amended claim 1. The disclosure of D1 is summarised above, and its technical field is gas generating compositions for inflating airbags. It is therefore directed to the same purpose as amended claim 1. In contrast, D2 belongs to the technical field of explosive compositions for the demolition of buildings. As discussed above, the compositions of D2 are not suitable for use in airbags, as the particle size is too large (the amount of explosive force generated is likely too large to be suitable for use in airbags). Accordingly D2 cannot be considered to be the closest prior art to amended claim 1 of the present application.

The difference between amended claim 1 and D1 is discussed above in the novelty section. In brief, D1 does not disclose compositions comprising hydrotalcite (HTC), or HTC in a 1:5 to 5:1 ratio with a carbide of boron, aluminium or silicon.

The HTC has the technical effect of reducing the level of noxious gases produced (para [011], "This combination...hydrotalcite"). This is demonstrated in Table 2 of the application as filed. Entry 4 shows lower amounts of CO and NO (i.e. noxious gases) than entry 1, which is the same composition absent the HTC. Comparative 3 also shows

that a composition containing HTC but no slag forming agent reduces the amounts of noxious gas, when compared to Comparative 1 having no slag forming agent or HTC.

Table 1 also shows that the HTC has the additional technical effect of forming a composition with SiC as slag forming agent which generates gas more quickly and is more efficient at collecting slag. Example 4 has quicker gas generation and higher percentage of collected slag than example 1, which contains SiC but no HTC. Furthermore, a comparison of example 1 and Comparative 3 shows that the HTC alone does not improve the percentage of collected slag, but rather it is the combination of SiC and HTC in the ratio claimed in amended claim 1.

Furthermore, example 4 containing HTC has the additional technical effect of forming a composition that is substantially more stable than the other pellets (para [022] of the application as filed).

The objective technical problem is therefore the provision of an improved airbag composition, which increases the percentage of oxides converted into slag, and reduces the level of noxious gases released.

The solution to this problem is a composition having HTC as a secondary slag forming agent, in a weight ratio of 1:5 to 5:1 with respect to a slag forming agent comprising a carbide of boron, aluminium or silicon.

The present invention solves this problem for the reasons specified above with respect to the comparative results in Tables 1 and 2 of the present application.

D1 does not disclose HTC in its compositions, in any ratio. D1 teaches that the efficiency of slag collection can be improved by adding a compound selected from oxides or hydroxides of Ti or Al to the airbag composition, preferably TiO₂. These additives are not HTC. As discussed above, the generic addition of "clays" in D1 is not a specific disclosure of HTC, and in any case D1 does not teach the skilled person that

any one clay (out of a possible very large number of clays) is particularly advantageous or is associated with a particular technical effect. Thus D1 provides the skilled person with no motivation to incorporate HTC into its airbag compositions to have any effect, far less to improve the efficiency of slag collection.

D1 also does not mention the problem of increasing the speed of gas generation, which is solved by the carbide+HTC of the composition of amended claim 1.

Furthermore, D1 recognises the problem of pellet stability of its compositions (para [006], "In order...treatment") but teaches the skilled person that the solution to this problem is not the addition of clays generally (or HTC specifically), but is heat treatment of the pellets.

Accordingly the skilled person following the teachings of D1 is provided with no motivation to incorporate HTC into its compositions, nor of any of the advantages of doing so. As such amended claim 1 must be considered to be inventive over D1.

The skilled person would not consider combining D1 with D2 because D2 belongs to a different technical field - explosive compositions suitable for demolition of buildings - and hence would not consider D2 to be relevant. D2 is also technically incompatible with D1, because D2 requires particles >1 mm in size, which the skilled person knows are not suitable for use in airbag compositions.

Even if the skilled person would consider D2 to be relevant, it provides no teaching that HTC solves the problem of improved airbag compositions with reduced noxious gas release and increased slag collection. Rather D2 teaches the skilled person that HTC can be added to its compositions to obtain a composition that is mechanically stable (para [003]). The skilled person following the teachings of D1 already knows that the compositions of D1 have improved mechanical stability from heat treatment. The skilled person is provided with no motivation to seek to incorporate this alternative means of stabilising its compositions.

Accordingly we submit that amended claim 1 is inventive over D1 in combination with D2.

We further submit that amended claims 2-7 are inventive over D1, either alone or in combination with D2, for at least the reason that they are dependent on or refer to inventive claim 1.

Other

The Examiner has objected that the particle size of the fuel components is an essential technical feature of the invention. To overcome this objection, amended claim 1 requires that the fuel particles have a size of 5 to 80 μm .

We submit that the claims on file now comply with the requirements of the EPC and are in order for grant. If the Examiner disagrees, he is hereby requested to issue a further Communication or a summons to oral proceedings. Oral proceedings are hereby requested.

Yours sincerely,

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Amended claims

1. Airbag composition comprising,
 - (i) 20 to 50 wt% of a fuel being selected from the group of tetrazole, aminotetrazole, nitrotetrazole, nitroaminotetrazole and triazole;
 - (ii) 30 to 70 wt% of an oxidant being selected from alkali metal or alkaline earth metal nitrate, chlorate or perchlorate;
 - (iii) 10 to 20 wt% of a slag forming agent comprising a carbide of boron, aluminium or silicon and hydrotalcite as a secondary slag forming agent, the hydrotalcite being present in a weight ratio of 1:5 to 5:1 with respect to the carbide;wherein the fuel particles have a size of 5 to 80 μm .
2. An airbag composition according to claim 1, further comprising a water-soluble polymer.
3. An airbag composition according to claim 1 or claim 2, further comprising a lubricant.
4. An airbag composition according to any one of claims 1 to 3, wherein the oxidant is a nitrate of an alkali metal or an alkaline earth metal.
5. An airbag composition according to any one of claims 1 to 4, wherein the slag forming agent comprises a carbide of silicon or aluminium.
6. Process for making the airbag composition according to any one of claims 1 to 5 comprising the steps:
 - (i) mixing the carbide slag forming agent with the hydrotalcite
 - (ii) mixing the mixture of step (i) with the remaining ingredients
 - (iii) pressing, for at least 5 minutes, the mixture into pellets

(iv) heat treating the pellets at a temperature between 80 and 120 °C for at least 10 hours.

7. Airbag comprising the airbag composition according to any one of claims 1 to 5.

Examination Committee I: Paper B Ch 2015 - Marking Details			Candidate No	
Category		Maximum possible	Marks awarded	
			Marker 004	Marker 007
Claims	Composition claim and process	25	25	25
Claims	Other claims	5	5	5
Arguments	Amendments	15	13	13
Arguments	Clarity	5	5	5
Arguments	Novelty	15	15	13
Arguments	Inventive Step	35	30	30
Total			93	91
Examination Committee I agrees on 92 points and recommends the grade PASS				