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**Datasheet for the decision
of 20 September 2019**

Case Number: T 0734/17 - 3.2.01

Application Number: 12161507.4

Publication Number: 2471692

IPC: B60R21/272, B60R21/274

Language of the proceedings: EN

Title of invention:

Gas generator for inflating a gas bag of a vehicle occupant restraint system and method of inflating a gas bag

Patent Proprietor:

Joyson Safety Systems Germany GmbH

Opponents:

TRW Airbag Systems GmbH
Autoliv Development AB

Headword:

Relevant legal provisions:

EPC Art. 54, 56, 123(2), 84, 111(1), 100(b)
RPBA Art. 12(4)

Keyword:

Novelty - main request (no) - auxiliary request 1 (no) -
auxiliary request 2 (yes)
Amendments - added subject-matter - auxiliary request 1a (yes)
- added subject-matter - auxiliary request 2 (no)
Claims - clarity - auxiliary request 2 (yes)
Remittal to the department of first instance for inventive step
of auxiliary request 2 (no) for adaptation of the description
(yes)
Inventive Step - auxiliary request 2 (yes)
Sufficiency of disclosure - (yes)

Decisions cited:

Catchword:



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Case Number: T 0734/17 - 3.2.01

D E C I S I O N
of Technical Board of Appeal 3.2.01
of 20 September 2019

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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
25 January 2017 concerning maintenance of the
European Patent No. 2471692 in amended form.**

Composition of the Board:

Chairman	G. Pricolo
Members:	S. Mangin
	P. Guntz

Summary of Facts and Submissions

- I. The appeals were filed by opponents 1 and 2 (respectively appellants 1 and 2) against the interlocutory decision of the opposition division finding that, on the basis of the auxiliary request 1, the patent in suit (hereinafter "the patent") met the requirements of the EPC.
- II. In particular, the opposition division decided that
(1) the patent disclosed the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 100(b))
(2) the subject-matter of auxiliary request 1 (corresponding to the main request in appeal proceedings) was novel over D1/D1bis, D3 and D9 (Articles 52(1) and 54 EPC) and involved an inventive step both starting from D9 or from A2 (Articles 52(1) and 56 EPC).
- III. Oral proceedings before the Board took place on 20.09.2019.
- IV. The appellants (opponents 1 and 2) requested that the decision under appeal be set aside and that the European patent be revoked.
- The respondent (patent proprietor) requested that the appeal be dismissed or, in the alternative, that the patent be maintained in amended form on the basis of any of auxiliary requests 1, 1a, or 2 to 7, auxiliary requests 1 to 7 as filed with the reply to the statement of grounds of appeal and auxiliary request 1a as filed with the letter dated 21 August 2019.
- V. In the present decision, reference is made to the following documents:

D1: EP 0882 629 A1
D1bis: US 6089597
D3: WO 0142047
D6: DE 602 03 590 T2
D9: US 5762368
A2: EP 0919781
A6: US 5263740

B1.2: Extract from the congress handbook 9th international Symposium and exhibition on sophisticated Car Occupant Safety Systems 2008, Lecture "Shockwave characterisation, parameter studies and visualization for a cold gas curtain inflator" H. Kratz and al ISSN 0722-4087

VI. The independent claims of the main request read as follows:

Claim 1:

- 1o Gas generator for inflating a gas bag of a vehicle occupant restraint system, comprising
- 1a - igniting means (2) for producing gas and heat upon activation by a control signal of the vehicle;
- 1b - a first chamber (11) comprising a propellant (3, 31) ignitable by gas and heat produced by the igniting means (2),
- 1c - a second chamber (12) comprising pressurized inflation gas;
- 1d - at least one an outlet opening (41) through which the inflation gas can flow out of the second chamber and into the gas bag;
- 1e - sealing means (46) sealing the outlet opening (41), wherein
- 1f - the gas generator (1) is configured in such a way that after activation of the igniting means gas and heat

- produced by the igniting means (2) ignites the propellant (3, 31)
- 1g and a pressure wave (100) is created in the pressurized gas under the direct or indirect impact of gas produced by the igniting means (2)
- 1h wherein the pressure wave (100) breaks the sealing means (46) such that inflation gas can escape from the second chamber (12) via the outlet opening (41)
- 1i - the igniting means (2) comprise a volume (222) for receiving gas produced by the igniting means upon activation, wherein
- 1j the volume (222) is sealed by further sealing means (152)
- 1k which break if the pressure in the volume (222) exceeds a maximum value, and wherein
- 1l the pressure wave (100) is created in the inflation gas due to the breakage of the further sealing means (152), characterized in that
- 1m the gas generator (1) is configured in such a way that the sealing means (46) break and inflation gas escapes from the outlet opening (41) before gas generated by combustion of the propellant (3, 31) enters into the second chamber (12).

Claim 14:

- 14o Method of inflating a gas bag of a vehicle occupant restraint system, comprising the steps of:
- 14a - providing a gas generator (1) having a first chamber (11) comprising a propellant(3, 31) and a second chamber (12) comprising pressurized inflation gas, wherein gas and heat produced by igniting means (2) can flow from the igniting means (2) into the second chamber (12), wherein the second chamber (12) further comprises an outlet opening (41) sealed by sealing means (46) through which

the pressurized gas can flow into the gas bag when unsealed, wherein the igniting means comprise a volume (222) for receiving gas produced by the igniting means upon activation, wherein the volume (222) is sealed by further sealing means (152) which break if the pressure in the volume (222) exceeds a maximum value;

- 14b - creating a pressure wave (100) in the pressurized inflation gas such that the sealing means (46) are broken under the impact of the pressure wave (100) and inflation gas escapes into the gas bag, wherein the pressure wave (100) is created in the inflation gas due to the breakage of the further sealing means (152); and
- 14c - igniting the propellant (3, 31) and guiding gas created by combustion of the propellant upon igniting into the second chamber (12),
characterized in that
- 14d the gas generator (1) is configured in such a way that the sealing means (46) break and inflation gas escapes from the outlet opening (41) before gas generated by combustion of the propellant (3, 31) enters into the second chamber (12).

VII. Claim 1 and claim 14 of auxiliary request 1 differ from claim 1 respectively claim 14 of the main request in that feature 1c respectively feature 14a require a "longitudinally extending second chamber (12) comprising pressurized inflation gas".

VIII. Claim 1 and claim 14 of auxiliary request 1a differ from claim 1 respectively claim 14 of the main request in that feature 1h respectively feature 14b require that "solely the pressure wave (100) breaks the sealing means (46)".

IX. Claim 1 and claim 14 of auxiliary request 2 differ from claim 1 respectively claim 14 of the main request in

that features 1j and 1k respectively feature 14a require that "the volume (222) is sealed by further sealing means (152) in the form of a bursting disk, wherein the further sealing means (152) break if the pressure in the volume (222) exceeds a maximum value".

Reasons for the Decision

1. Main request - Novelty - Articles 52(1) and 54 EPC
- 1.1 The subject-matter of claim 1 is not novel over D1bis. All the features of claim 1, in particular features 1g, 1h, 1i, 1j, 1k, 1l and 1m, which were contested by the patent proprietor, are disclosed in D1bis.
 - 1.1.1 Feature 1g, 1h and 1l of claim 1 require that:
 - "a pressure wave (100) is created in the pressurized gas under the direct or indirect impact of gas produced by the igniting means (2)" (feature 1g)
 - " wherein the pressure wave (100) breaks the sealing means (46) such that inflation gas can escape from the second chamber (12) via the outlet opening (41)" (feature 1h)
 - "and wherein the pressure wave (100) is created in the inflation gas due to the breakage of the further sealing means (152)" (feature 1l).

D1bis column 5, line 53 - line 55 discloses "The ignition cap is constructed in such a way that its end wall which faces the bursting disc 32 opens first, and hot gases and particles enter the expansion space 41 at high speed, accompanied by a blast wave".

A blast wave is a pressure wave expanding outward from an explosive core, in the present case the primary and secondary charges contained in the ignition cap 31.

Thus in the gas generator of D1bis, a pressure wave is created in the expansion space 41 comprising pressurized gas due to the breakage of the end wall of the ignition cap, corresponding to the further sealing means in the contested patent.

Furthermore D1bis, column 5, line 64 - column 6, line 2 discloses: "The distance of the bursting disc 23 from the igniter 27 and its physical and chemical characteristics and also the position and the size of the passage opening 51 are adapted to each other such that the hot gases and the hot particles in combined action with the blast wave, destroy the bursting disc 23".

The above passage directly and unambiguously discloses that in the gas generator of D1bis, the blast wave (pressure wave) destroys the bursting disc. Further passages in D1bis disclose the blast wave destroying the bursting disc 23: D1bis, column 3, lines 5-9 and D1bis, column 3, line 66 - column 4, line 9.

Although the destruction of the bursting disc 23 in the gas generator of D1bis is not due to the blast wave alone, the blast wave is contributing to the destruction of the bursting disc. Feature 1h is therefore disclosed in D1bis.

- 1.1.2 The Proprietor is of the opinion that feature 1h requires that the pressure wave alone breaks the sealing means. This interpretation is supported in his view by paragraphs [0016] and [0040] of the patent.
- 1.1.3 Paragraphs [0016] and [0040] of the contested patent disclose the sealing element being solely broken under the impact of the pressure wave running across the

pressurized inflation gas and not by combustion gas that is generated by the combustion propellant.

However these passages cannot be used to interpret claim 1 in a more narrow way , i.e. limiting feature 1h to the pressure wave solely breaking the sealing means. Claim 1 and in particular feature 1h is clear to a person skilled in the art and must be given its broadest, technically reasonable interpretation. Feature 1h does not require the sealing means to be broken exclusively i.e. solely by the pressure wave, such that the blast wave with the hot gas and/or the hot particles destroying the bursting disc in D1bis takes away the novelty of this feature.

- 1.1.4 Features 1i, 1j and 1k require that: "the igniting means (2) comprise a volume (222) for receiving gas produced by the igniting means upon activation, (feature 1i) wherein the volume 222 is sealed by further sealing means, (feature 1j) which break if the pressure in the volume (222) exceeds a maximum value (feature 1k)"
- 1.1.5 D1bis column 4, lines 50-55, discloses that "the charges are surrounded by an ignition cap 31 which is welded to the base plate 25" and D1bis column 5, lines 53-55, discloses that "the ignition cap 31 is constructed in such a way that its end wall which faces the bursting disc 32 opens first, and hot gases and particles enter the expansion space 42 at high speed accompanied by a blast wave". D1bis discloses in the two above passages a volume delimited by the ignition cap. This volume comprises the ignition wire connecting two wires as well as the primary and the secondary charges. Space is present

between the charges as the charges are usually sintered powder such that gas produced by the igniting means will be first collected in this space and when the pressure has exceeded the value necessary to break the ignition cap, the end wall of the cap will open. It is to be noted that at the latest a volume to receive gas, will be generated with the ignition of the charges, producing gas.

1.1.6 The patent proprietor, referring to figure 1 of D1bis, explains that the ignition cap 31 is completely filled with ignition material and that no volume is present in the ignition cap for receiving gas before the ignition of the igniting means.

1.1.7 The proprietor's argument cannot be accepted. Figure 1 of D1bis is schematic and cannot be relied upon to show the presence or the absence of a volume for receiving gas produced by the igniting means. Moreover claim 1 does not require the volume for receiving the gas to be present before ignition of the charges as alleged by the proprietor. Claim 1 does not therefore rule out the ignition charges in the ignition cap freeing space for the produced gas.

1.1.8 Feature 1m requires that: "the gas generator is configured in such a way that the sealing means (46) break and inflation gas escapes from the outlet opening (41) before gas generated by combustion of the propellant enters into the second chamber (12)"

1.1.9 D1bis (column 5, line 58 - column 6, line 16) discloses that the primary and secondary charges deflagrate and produce hot gas and hot particles, which enter at high speed in the expansion space 41 accompanied by a blast wave and move through the passage opening 53 towards

the mixing chamber without having lost a partial amount of their energy by impact onto a wall or other parts and strike directly onto the bursting disc 23.

Dlbis (column 6, lines 22-59) discloses as well that the other part of hot gases and particles not flowing via the passage opening 53 are distributed uniformly in the expansion space 41, where they are partially reflected by the wall of the igniter diffuser 37 surrounding them. By means of the igniter diffuser 37, the blast wave expanding inside the expansion chamber 41 is also prevented from continuing unimpeded into the combustion chamber 45 and from causing destruction of the propellant tablets there.

Dlbis discloses therefore clearly and unambiguously that part of the hot gas and hot particles is directed at high speed along a straight path towards the bursting disc without losing energy while the other part of the hot gas and particle going through the diffuser and via the radial passage openings 43 to the combustion chamber 45 is prevented from flowing unimpeded.

This is confirmed by the passage on column 6, line 64 - column 7, line 1 disclosing that: "Due to the fact that the destruction of the bursting disc 23 is effected as good as exclusively by means of deflagration of the ignition material and hence very quickly, it is possible to open the bursting disc 23 approximatively at the same time as the igniting propellant 47". Thus the bursting disc 23 corresponding to the sealing means of claim 1 breaks and inflation gas escapes from the outlet opening 41 before gas generated by the combustion of the propellant 47 enters the mixing

chamber 35 corresponding to the second chamber of claim 1.

The above reading of D1bis is in line with the aim of the gas generator of D1bis, namely to release gas even more quickly (D1bis column 1, lines 54-56) and to minimise overpressure inside the gas generator in order to design the walls of the gas generator thinner (D1bis, column 2, lines 33-39 and column 7, lines 1-6).

- 1.1.10 The patent proprietor is of the opinion that feature 1m is not directly and unambiguously derivable from D1bis. Especially as D1bis discloses that: "it is possible to open the bursting disc 23 approximately at the same time as the igniting propellant 47". In his view the term "approximately" encompasses the fact that the bursting disc 23 may be opened a little after the ignition of the propellant and in this case the gas generated by the combustion of the propellant would have time to enter the mixing chamber 35 before the bursting disc 23 is open. Feature 1m would then not be verified.

Furthermore, column 7, lines 1-6 discloses that a "relatively small overpressure occurs" which in the proprietor's view means that gas has been generated by the combustion of the propellant before the bursting disc broke.

Finally, the patent proprietor is of the opinion that D1bis does not disclose any dimensions for the gas generator of D1bis which prevents reliable simulations to be made to demonstrate that the bursting disc 23 breaks before gas generated by the propellant enters the mixing chamber 35.

1.1.11 The Board cannot follow the lines of argumentation of the proprietor. The term "approximately" has to be understood in the context of the contested patent. Indeed the opening of the bursting disc and the ignition of the propellant will not occur exactly at the same time. As opposed to the opening of the bursting disc, which is instantaneous, the igniting of propellant and the generation of gas is gradual. The word "approximately" in D1bis is certainly not used to mean that the opening of the bursting disc may occur a little after the propellant is ignited as alleged by the patent proprietor. But even if this was the case the gas generated by the propellant would still need to travel to the mixing chamber 35 either via the openings 49 through the pressure chamber 15 and via the openings 51 or back via the openings 43 through the diffuser 37 and via the opening 53. Both passageways require time such that the opening of the bursting disc 23 would definitely occur before the gas generated by the propellant enters the mixing chamber 35.

Similarly column 7, lines 1-6 of the contested patent: "Owing to the rapid opening of the gas generator, only a relatively small overpressure occurs in the gas generator itself (...)" has to be read in view of the contested patent as a whole. As opposed to the prior art cited in D1bis, where the bursting disc is destroyed by the pressure rise caused by the propellant (D1bis, Column 1, lines 15-19), D1bis proposes a gas generator, where the bursting disc is exclusively opened by the deflagration of the ignition material, generating a blast wave which is directed immediately onto the bursting disc (column 1, line 67-column 2, line 7).

Finally the dimensions of the gas generator and the size of its different chambers and openings are indeed not disclosed in D1bis, but D1bis discloses several results to be achieved which imply certain dimensions for the gas generator. For example on column 5, line 64- column 6, line 2: "The distance of the bursting disc 23 from the igniter 27 and its physical and chemical characteristics and also the position and size of the opening 51 are adapted to each other such that the hot gases and the hot particles in combined action with the blast wave, destroy the bursting disc 23". It is to be noted that the contested patent is drafted in a similar way, while the dimensions of the gas generator are not disclosed in the contested patent, features such as feature 1m imply certain sizes and proportions for the different chambers and passages.

2. Auxiliary request 1 - Novelty - Articles 52(1) and 54 EPC
- 2.1 The subject matter of claim 1 of auxiliary request 1 is not novel either over D1bis. The introduction of the second chamber being "longitudinally extending" does not confer novelty to claim 1. In D1bis the mixing chamber 15, corresponding to the second chamber, is cylindrical and extends along the longitudinal axis and is therefore longitudinally extending.
- 2.2 The patent proprietor is of the opinion that "longitudinally extending" means elongated, in other words that the second chamber is longer along the longitudinal axis than it is wide. The patent proprietor is of the view that the term "longitudinally extending" cannot be interpreted to only mean extending in the longitudinal direction as every three dimensional object would then be longitudinally

extending. The subject-matter of claim 1 is therefore in his view novel over D1bis.

2.3 The Board cannot follow this line of argumentation, the longitudinally extending second chamber cannot be restricted to meaning a chamber being longer along the longitudinal axis than wider especially in view of the paragraph [0019] of the A1 publication. Indeed this paragraph gives an example of a longitudinally extending chamber: " e.g. the second chamber is formed by a hollow cylindrical part (e.g. a container)". This example does not convey the restricted meaning given by the patent proprietor. The expression "longitudinally extending" is to be given its usual meaning, i.e. extending in the longitudinal direction. The mixing chamber 35 in D1bis being similar to the second chamber of the contested patent, a hollow cylinder, the subject-matter of claim 1 is not novel over D1bis.

3. Auxiliary request 1a - Added subject-matter - Article 123(2) EPC

3.1 The introduction of the term "solely" in claim 1 introduces subject-matter which extends beyond the application as originally filed. Paragraph [0040] of the patent in suit, corresponding to page 10, lines 15-25 of the application as originally filed, which is indicated as the basis for the amendment by the patent proprietor reads: "As the sealing element 46 sealing the outlet opening 41 is solely broken under the impact of the pressure wave running across the pressurized inflation gas and neither under the direct impact of gas nor under the impact of combustion gas created by combustion of the propellant, in the initial inflation phase "pure" (i.e. relatively cold) pressurized inflation gas escapes from

the second chamber before a mixture of inflation gas and combustion gas reaches the outlet opening 41 and flows into the gas bag".

While the above passage discloses that the sealing element 46 is solely broken by the impact of the pressure wave, it further specifies that this is done neither under the direct impact of gas nor under the impact of combustion gas created by the combustion of the propellant and that in the initial phase pure pressurized inflation gas escapes from the second chamber before a mixture of inflation gas and combustion gas reaches the outlet opening 41 and flows into the bag. These additional features which are inextricably linked to the fact that the outlet opening is solely broken under the impact of the pressure wave have been omitted in claim 1 which leads to an unallowable intermediate generalisation.

Furthermore the "sealing element being solely broken under the impact of the pressure wave" in paragraph [0040] of the patent specification is disclosed in the context of figures 2A-2D, wherein a hollow element 15 with radial openings 151 is present (see paragraph [0039] of the patent or page 10, lines 5-15 of the application as filed). This specific arrangement enabling the "sealing element to be solely broken under the impact of the pressure wave" has also been omitted in claim 1 leading as well to an unallowable intermediate generalisation.

4. Auxiliary request 2

4.1 Admissibility of auxiliary request 2 - Article 12(4) RPBA

While the admissibility of auxiliary request 2 is contested by the opponents, this request has been

submitted in opposition proceedings during oral proceedings (see page 11, points 4.24 and 4.28 and Annex 1 of the minutes of the oral proceedings in opposition) and has also been submitted in appeal proceedings with the reply to the grounds of appeal. The Board has thus no discretion not to admit auxiliary request 2 according to Article 12(4) RPBA.

4.2 Clarity - Article 84 EPC

The Board does not share the opinion of the opponents, who consider that the introduction of "the further sealing means being in the form of a burst disk" in claims 1 and 14 is unclear. A burst disk is a one-time-use membrane installed on a chamber that fails at a predetermined differential pressure. Furthermore burst disks are well known in gas generators for air bags as can be seen from the prior art (e.g. "bursting disc" in D1bis, "burst disc" in D3 and B1.2). Auxiliary request 2 fulfills therefore the requirements of Article 84 EPC.

4.3 Added subject-matter - Article 123(2) EPC

4.3.1 Auxiliary request 2 meets the requirements of Article 123(2) EPC. The basis for the introduction of "in the form of a burst disk, wherein the further sealing means (152)" is based on paragraph [0009] of the patent, corresponding to page 2, lines 28-30 of the application as filed: "The pressure wave in the second chamber is generated by employing further sealing means (e.g. a burst disk) that seal a volume of the igniting means, wherein the sealing means break if pressure in the volume exceeds a certain value". The use of a burst disk as sealing means is disclosed in a general manner, i.e. not linked to any specific arrangement of the gas

generator. Therefore the introduction of the sealing means being in the form of a burst disk does not extend beyond the application as originally filed.

4.3.2 The opponents are of the opinion that the introduction of the sealing means (152) being in the form of a burst disk extends beyond the content of the application as originally filed since a volume enclosing an igniter is not claimed although inextricably linked to the introduced burst disk.

4.3.3 The Board cannot follow this line of argumentation as claim 1 reads: "the igniting means (2) comprises a volume (222) for receiving gas produced by the igniting means upon activation, wherein the volume (222) is sealed by further sealing means (152) in the form of a burst disk". The fact that the burst disk seals a volume of the igniting means is present in claim 1.

4.4 Novelty - Articles 52(1) and 54 EPC

4.4.1 The subject-matter of claims 1 and 14 is novel over D1, D1bis, D3 and A2

(a) D1 and D1bis do not disclose the sealing means being in the form of a burst disk.

D1bis, column 4, lines 49-54 discloses that the charges are surrounded by an ignition cap 31 which is welded to the base plate 25".

D1bis, column 5, lines 53-64 further discloses:

"The ignition cap 31 is constructed in such a way that its end wall which faces the bursting disc 32 opens first, and hot gases and particles enter the expansion space 41 at high speed, accompanied by a blast wave. The hot gases expand uniformly in the expansion space 41 and are distributed therein.

Since, as stated, the end wall opens first owing to star-shaped impressions provided therein, a spreading results in particular in axial direction, (...)"

In D1bis the sealing means is an ignition cap 31 welded at its base comprising an end wall with a star shaped impression, which opens first. The ignition cap of D1bis cannot be considered as a direct and unambiguous disclosure of a burst disk. Indeed a burst disk is a membrane which is installed on a chamber and which breaks when the pressure exceeds a certain value.

Opponent 1 is of the opinion that claim 1 does not define the burst disk being separate from the igniter means or that a volume is present between the igniter means and the burst disk. In D1bis, the front end of the cap opening first can thus be considered as a burst disk.

The Board cannot follow the above argumentation, while the front end of the cap 31 in D1bis opens first it cannot be considered as a direct and unambiguous disclosure of a burst disk. D1bis itself makes a clear distinction between the ignition cap 31 having a front wall opening first and a bursting disc 23 installed on the mixing chamber 35.

The above argumentation applies mutatis mutandis to document D1 where the "Zünderkappe 33" corresponds to the ignition cap 31 of D1bis and the "Berstscheibe 43" installed on the mixing chamber 11 (Mischkammer) corresponds to the bursting disc 23 of D1bis.

(b) D3 does not disclose feature 1m of claim 1 and feature 14d of claim 14, namely that "the gas generator is configured in such a way that the sealing means (46) break and inflation gas escapes from the outlet opening (41) before gas generated by combustion of the propellant enters into the second chamber".

D3, page 3, lines 14-18 discloses: "In another embodiment, additional active ingredient or composition (e.g. propellant) is provided in the inflator housing and is activated after the initiator charge is ignited. Regardless, the generated shock wave is used in opening the burst disc and it is not opened due to heated gas having essentially the same pressure throughout the inflator housing" and page 6, lines 22-28 discloses opening the burst disc 60 by generating a pressure wave with the initiator charge only or, alternatively, with the initiator charge together with one or more active ingredients or compositions provided in the inflator housing 24 (e. g. as part of a propellant).

While D3 discloses an embodiment with propellant, D3 does not disclose that the burst disc 60, corresponding to the sealing means (46) of claim 1, breaks before gas generated by the combustion of the propellant enters into the inflator housing 24, corresponding to the second chamber (12).

According to opponent 1 as D3 discloses on page 6, lines 25-28 that propellant may be provided in the inflator housing 24 and on page 7, lines 18-20 that no barrier or impediment should be present between the bursting disc 60 and the shock wave generated at the first end 28 of the inflator housing 24, the

propellant will thus be placed on the sides similarly to figure 7C of the patent in suit.

This line of argumentation cannot be followed. In D3 there is no direct and unambiguous disclosure of the location of the propellant, other than in the inflator housing. Stating that the propellant is located in a similar way as in figure 7C of the patent in suit is speculative and cannot be used to imply that features 1m and 14d are disclosed in D3.

Opponent O2 is of the opinion that the inflator of D3 has the same construction as the inflator of the patent in suit and thus inherently verifies feature 1m.

The Board cannot follow this argumentation as D3 does neither in the description nor in the drawings disclose the location of the propellant other than in the inflator housing 24. From the teaching of D3, an exact position of the propellant cannot be directly and unambiguously derived such that features 1m and 14d cannot be directly and unambiguously derivable from D3.

- (c) A2 does not disclose that "the pressure wave (100) breaks the sealing means (46) such that inflation gas can escape from the second chamber (12)" (features 1h of claim 1 and 14b of claim 14). In A2, paragraph [0033], it is not the pressure wave which opens the closure disk of the gas generator of A2 but the projectile 208.

Opponent 2 is of the opinion that claim 1 respectively claim 14 do not require that it is only and solely the pressure wave which breaks the

sealing means, on the contrary claim 1 covers in his view inflators comprising a physical part actuated by a pressure wave breaking the sealing means. In A2, the projectile 208 is actuated by the pressure wave, and breaks the closure disk 146 such that A2 discloses feature 1h of claim 1 and 14b of claim 14.

The interpretation of feature 1h and 14b by opponent 2 cannot be followed. While the pressure wave may not be the only cause for the breaking of the sealing means, the pressure wave reaches the sealing means and participates directly to its opening. In A2, the pressure wave generated by the initiator 182 does not reach the closure disk 146. The projectile 208 alone is propelled through the closure disk 146.

4.4.2 Remittal to the opposition division - Article 111(1) EPC

The appellants request the case to be remitted to the opposition division for further prosecution as inventive step of auxiliary request 2 had not been dealt with by the opposition division.

The appellants do not have absolute right to have each individual issue considered by two instances, Article 111(1) EPC leaving it to the discretion of the Board whether to exercise any power within the competence of the department of first instance or to remit the case to that department. In the present case the Board decides not to remit the case to the opposition division for the following reasons: the introduction of sealing means being in the form of a burst disk is not an amendment which changes substantially the legal and

factual framework of the appeal. Auxiliary request 2 had already been submitted in opposition proceedings and in reply to the grounds of appeal, such that the parties should be prepared to deal with the inventive step of this request. Moreover as can be seen from the following inventive step discussion, the arguments provided for inventive step by the appellants are similar to the ones presented for auxiliary request 1 in opposition proceedings.

To conclude, as the factual and legal framework has substantially not changed, the Board decides to deal with the issue of inventive step of auxiliary request 2.

4.4.3 Inventive step - Articles 52(1) and 56 EPC

The inventive step attacks presented by the appellants do not allow the conclusion that the subject-matter of claims 1 and 14 would not involve an inventive step.

(a) Inventive step attack starting from D9 in combination with D6 or B1.2

Figures 5-9 of D9 disclose a gas generator for inflating a gas bag comprising two igniters, an igniter 324 for generating a shock wave, which ruptures the closure 228 and another igniter 302 to ignite the propellant in the chamber 270.

The subject-matter of claims 1 and 14 differs from the gas generator for inflating a gas bag in that it comprises a further sealing means (152) in the form of a burst disk.

According to paragraph [0009] of the patent in suit, the sealing means (e.g. a burst disk) seal a volume of the igniting means and break if the pressure in the volume exceeds a certain pressure, inducing a pressure wave in the inflation gas.

Starting from D9, the problem to be solved may be regarded as to provide alternative means to generate a pressure wave.

While D6, figure 1, paragraphs [0028] and [0029], discloses the arrangement of a burst disk 18 at the end of the tube 14, the Board is of the opinion that the skilled person would not combine the teaching of D9 and D6 to arrive at the subject-matter of claim 1 for the following reasons:

In the hybrid gas generator of D9, the tube 320 comprising the shock wave generator is spaced radially from the container 222 and the burst disk 228 and defines a passage 322 which is in fluid communication with the chamber 224 (See D9, column 7, lines 54-63). There is no incentive for the skilled person to add a burst disk at the end of the tube 320 or to replace the pressure wave generator arrangement of D9 by the one of D6, which would require adjusting the pressure inside the tube 320 and the container 222 to obtain the desired effect.

If cost reduction were to be the incentive for changing the shock wave generator as claimed by the appellant 2, then the skilled person would rather consider using a single igniter and / or arranging the igniter axially opposite of the burst disk. The skilled person would actually end up using the gas generator depicted on figures 1-4 of D9.

Finally the gas generator of figures 5-9 of D9 is conceived in a very different manner from the one disclosed in D6. The gas generator of D9 is a hybrid gas generator with two igniters while the gas generator of D6 is a cold gas generator with a single igniter arranged axially opposite to the sealing means sealing the outlet opening. Starting from D9, should the skilled person nevertheless look for an alternative way to generate the shock wave, he/she would not look into D6.

Similarly to D6, B1.2 deals with a cold gas generator (CCI: Cold gas Curtain Inflator) and the above considerations apply to the combination of D9 with B1.2. Page 8-6 of B1.2 discloses the various parameters to be adjusted to optimise the opening of the burst disk in the specific structure of the CCI in particular the initiator housing free volume. It is to be noted that in the gas generator of D9, no initiator housing free volume is present. The initiator free volume is thus not a parameter the skilled person could simply adjust. The skilled person would thus first need to add a burst disk to create the initiator housing free volume and then adjust it. For the gas generator arrangement of figure 5 of D9 other parameters can and would rather be adjusted by the skilled person to optimise the opening of the burst disk such as the radial space between the axis of the container and the burst disk and the axis of the igniter.

(b) Inventive step attack in view of D1bis in combination with B1.2

The gas generator of D1bis is a hybrid gas generator comprising an igniter, which will both burst the

sealing means placed at the outlet opening and ignite the propellant.

The subject-matter of claims 1 and 14 differs from the gas generator of D1bis in that it comprises a further sealing means in the form of a burst disk.

Starting from D1bis, the problem to be solved is to provide an alternative way of generating a pressure wave in the second chamber.

Opponent 2 is of the opinion that the skilled person would look into B1.2, p.8-4, p.8-6, figures 7 and the basic trends disclosed below the figure and implement the burst disk of the cold gas inflator of B1.2 into D1bis and arrive at the subject-matter of claims 1 and 14.

The Board cannot follow this line of argumentation for the following reasons:

The skilled person looking to improve the gas generator of D1bis would not look into the study of B1.2 dealing with cold gas curtain inflators. An important aspect of the hybrid gas generator of D1bis is the ignition of the propellant, which will impose requirements on the arrangement of the igniter.

Even if the skilled person starting from D1bis would look into the gas generator of B1.2, he would not add the burst disk as alleged by opponent 2. D1bis is a hybrid gas generator and the igniter 27 has a double function, namely to create a pressure wave to break the sealing means 23 and to ignite the propellant placed on the side of the igniter. While B1.2 discloses advantages of placing a burst disk at the end of a housing/tube such as on figures 1, 2 and 7 of B1.2, the skilled person would jeopardise the ignition of the

propellant by placing such an arrangement in the gas generator of D1bis. Indeed, should the skilled person add an arrangement similar to B1.2 where a burst disk is placed at the end of a housing/tube, then the housing/tube would hinder the ignition of the propellant.

(c) Inventive step attack starting from A2 in combination with B1.2

A2 discloses a hybrid gas generator using a projectile 208 to break the closure disk 146.

The subject-matter of claims 1 and 14 differs from the gas generator of A2 in that the sealing means sealing the outlet is broken by a pressure wave.

Starting from A2, the problem to be solved is to provide an alternative way of breaking the closure disk 146.

Appellant 2 is of the opinion that the skilled person would combine the teaching of A2 with B1.2 to arrive at the subject-matter of claims 1 and 14.

The Board cannot follow this line of attack either. The projectile 208 of A2 provides a sealing function in addition to initiating the flow from the inflator 50. The first head 216 seals the first chamber 110 such that substantial portions of the inflation gases flow out of the gas generator 62 via the outlet ports 170 and into the second chamber 114. (See A2, paragraphs [0032]- [0033]). Replacing the projectile with an arrangement similar to B1.2, would not enable the first chamber 110 to be sealed and substantial portions of the inflation gases to flow in the second chamber. The

skilled person would therefore not change the projectile to an arrangement such as in B1.2.

None of the inventive step attacks presented by the appellants are convincing. The subject-matter of claims 1 and 14 therefore involves an inventive step.

4.4.4 Sufficiency of disclosure - Art. 100(b) EPC

The Board is of the opinion that the invention is described in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. The opposition division is correct on this matter. Reference is made to the decision of the opposition division point 7.1.3.

Opponent 2 is of the opinion that:

- (a) features 1g, 1h, 1l and 1m (and respectively 14b, 14d) cannot be reproduced. In particular opponent 2 is of the opinion that the patent does not disclose any concrete example of pyrotechnical material and structural figures to build the igniting means to create the pressure wave required to break the sealing means and ignite the propellant before gas generated by combustion propellant enters into the second chamber. In his view 18 parameters need to be adjusted to reproduce the invention, which results in a research programme.

The Board is of the opinion that while no concrete example is provided in the patent, figures 1-2D in particular and the related paragraphs as well as paragraphs [0008]-[0021] disclose in a general manner the shape of the gas generator and its necessary features. These indications are

sufficient for the skilled person to adjust the various parameters and arrive at the gas generator of the invention. The skilled person knows the parameters to be adjusted and the effect of adjusting the various parameters, such that with a reasonable amount of trial and error he can arrive at the invention.

Moreover although opponent 2 alleges that simulations are not common practice for the skilled person in the art, document B1.2 studying shockwave in cold gas curtain inflator uses Fluid Dynamic Simulations and opponent 2 used simulations to built his case. Opponent 2 failed to bring convincing evidence why the skilled person at the time of filing could not use simulations.

- (b) The effect of the feature 1m (and 14d) cannot be verified.

In particular opponent 2 alleges that it is impossible to determine when gases generated by the combustion of the propellant enter the second chamber, but does not provide evidence. It claims that with pressure sensors, the skilled person cannot determine if the pressure is generated by the propellant and that Xray and IR measurements are transparent to gases and cannot be made in closed steel tube.

Again the opponent has not provided sufficient evidence that this was not possible. Moreover it seems that schlieren photography could also be used to visualise the gases as disclosed in B1.2.

- (c) Claim 1 (and claim 14) covers non working embodiments for the effect of feature 1m (feature 14d).

Appellant 2 alleges that in the embodiment depicted on figure 7C, feature 1m is not verified. To prove his point, appellant 2 provides a modified figure based on figure 7C, where one of the propellant ring has a smaller inner diameter than on figure 7c. Based on this modified arrangement he concludes that the patent covers non working embodiments leading to a lack of sufficiency of disclosure. It is to be noted that the modified figure 7C is not part of the patent specification, but has been envisaged by appellant 2 based on figure 7C. Moreover this modified embodiment which would indeed probably not verify feature 1m would be disregarded by the skilled person, as it does not fall under claim 1, feature 1m not being fulfilled.

- (d) To conclude, opponent 2 who bears the burden of proof for the fact that the patent does not disclose the invention in a manner sufficiently clear and complete for it to be carried out by a skilled person, failed to bring convincing evidences that raise serious doubts that the skilled person cannot carry out the invention. The Board therefore judges that the requirements of Articles 100(b) are fulfilled.

4.4.5 Remittal to the opposition division for the adaptation of the description under Article 111(1) EPC.

Finally, in accordance with the view expressed by the parties at the oral proceedings, the Board finds it expedient to remit the case to the opposition division in order to bring the description in line with auxiliary request 2 (Article 111(1) EPC).

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the opposition division with the order to maintain the patent in amended form on the basis of auxiliary request 2 as filed with the reply to the statement of grounds of appeal and a description to be adapted thereto.

The Registrar:

The Chairman:



A. Vottner

G. Pricolo

Decision electronically authenticated