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**Datasheet for the decision
of 24 October 2017**

Case Number: T 2147/14 - 3.2.03

Application Number: 03795265.2

Publication Number: 1541958

IPC: F42B3/04, B60R22/46, B60R21/26,
B01J7/00, F23Q13/00

Language of the proceedings: EN

Title of invention:
MICRO GAS GENERATOR WITH AUTOMATIC IGNITION FUNCTION

Patent Proprietor:
NIPPON KAYAKU KABUSHIKI KAISHA

Opponent:
TRW Airbag Systems GmbH

Headword:

Relevant legal provisions:
EPC Art. 100(c), 100(a), 56
RPBA Art. 13(1)

Keyword:

Substantial procedural violation - appealed decision
sufficiently reasoned (no)
Amendments - added subject-matter (no)
Inventive step - main request (no) - auxiliary request (yes)
Late-filed request - admitted (no)

Decisions cited:

Catchword:



Beschwerdekammern
Boards of Appeal
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Case Number: T 2147/14 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 24 October 2017

Appellant: TRW Airbag Systems GmbH
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 10 October 2014
rejecting the opposition filed against European
patent No. 1541958 pursuant to Article 101(2)
EPC.**

Composition of the Board:

Chairman G. Ashley
Members: V. Bouyssy
E. Kossonakou

Summary of Facts and Submissions

- I. European patent No 1 541 958 (in the following: "the patent") concerns a micro gas generator with auto-ignition function.
- II. The patent as a whole was opposed on the grounds of unallowable amendment before grant (Article 100(c) EPC), lack of novelty and lack of inventive step (Article 100(a) EPC).
- III. The opposition division decided to reject the opposition.
- IV. This decision was appealed by the opponent (in the following, "appellant").
- V. With the summons to oral proceedings, the Board sent a communication pursuant to Article 15(1) of the Rules of Procedure of the Boards of Appeal (RPBA) indicating its preliminary opinion of the case.
- VI. Oral proceedings before the Board were held on 24 October 2017.
- VII. Requests

The appellant requested that the decision under appeal be set aside and the patent be revoked.

The patent proprietor (in the following, "respondent") requested that the appeal be dismissed, alternatively that the decision under appeal be set aside and the patent be maintained on the basis of one of auxiliary requests III and VI filed with letter dated 14 September 2017.

VIII. Claims of the respondent's requests

(a) Main request

Independent claim 1 as granted reads as follows (the feature numbering is introduced by the Board for ease of reference):

A micro gas generator comprising

- a) a gas generating agent,
- b) a cup body (3) for filling the gas generating agent (5) therein and
- c) a holder (1) with a squib (2),
- d) fixedly sealing the squib (2) in the cup body, characterised in that
- e) an automatic igniting agent layer (4) is provided
- f)
 - f1) at the bottom and
 - f2) on the side of the inner surface of the cup body (3), and
- g) wherein the automatic igniting agent layer (4) is formed by applying a solution containing the automatic igniting agent (4) on the inner surface of the cup body (3) and then drying.

(b) Auxiliary request III

Claim 1 differs from claim 1 of the main request in that it comprises the additional limitation that "the weight of the automatic igniting agent layer (4) is within the range of 3 mg to 100 mg for a weight of the gas generating agent within the range of 300 mg to 2000 mg".

(c) Auxiliary request VI

Claim 1 differs from claim 1 of the main request by the additional limitation that

- h) "the weight of the automatic igniting agent layer (14) [sic] is 3 mg to less than 10 mg".

IX. Cited evidence

In the statement setting out the grounds of appeal, the appellant relied among others on the following prior art documents which were filed in the opposition proceedings and are cited in the decision under appeal:

D1: WO 95/11421 A1
D3: US 5,299,828
D4: WO 02/43990 A2

X. The arguments of the parties, insofar as relevant for the present decision, can be summarised as follows:

(a) Right to be heard - Lack of reasoning

The appellant complained that its attack against inventive step in light of D1 and common general knowledge had not been dealt with in the opposition division's decision, contrary to Article 113(1) EPC.

The respondent stated that this attack had been duly discussed in the oral proceedings before the opposition division.

(b) Main request - Article 100(c) EPC

During the examination proceedings, feature (f) was introduced in claim 1.

The appellant argued that this amendment amounted to an unallowable intermediate generalisation because feature (f) was originally disclosed only in combination with the further feature that the holder and the squib are prepared separately and integrated by caulking (see paragraph 13 of the application as published, i.e. EP 1 541 958 A1) and this further feature had not been incorporated in claim 1.

The respondent argued that the amendment was supported by the teaching in paragraph 12 of the application as published.

(c) Main request - Inventive step

Appellant's case:

The subject-matter of claim 1 lacks an inventive step in light of D4 and D3.

The claimed subject-matter differs from the micro gas generator disclosed in D4 only by features (f2) and (g). They solve the technical problem of how to achieve a fast auto-ignition upon a fire accident, irrespective of the direction of heat applied to the gas generator.

For the skilled person seeking to solve this problem it would be straightforward in light of the general teaching of D3 to apply a coating of auto-igniting agent as a slurry over almost the entire inner surface of the cup body of the gas generator disclosed in D4. In so doing he would inevitably arrive at features (f2) and (g) of claim 1.

Respondent's case:

Distinguishing features (f2) and (g) have the double effect of shortening the auto-ignition time while guaranteeing that the exhaust gas remains clean. Indeed, feature (g) must be read to mean that only a small amount of auto-igniting agent is used to form a thin film-like layer in the cup body. The exhaust gas of the gas generating agent cannot be contaminated by such a small amount of auto-igniting agent.

For the skilled person starting from D4 it would require an inventive step to arrive at the gas generator of claim 1. D3 could not lead him to the claimed solution since it fails to address the problem of cleanliness of the exhaust gas. Further, D3 and D4 provide diametrically opposed teachings as to how to apply the auto-igniting agent and thus the skilled person would be deterred from combining these. Moreover, D3 discloses a gas generator which has a completely different structure from that of the gas generator of D4, in particular a boosting agent centrally disposed in the vessel, and thus the teachings of D3 and D4 could not be combined. In any case, even if a combination of these teachings would be made, it would lack the feature (g) that a small amount of auto-igniting agent is applied as a solution to form a thin film-like layer in the cup body.

(d) Auxiliary request III - Admissibility

The appellant requested that auxiliary request III be held inadmissible because it was filed too late, because the feature which has been added to claim 1 related to subject-matter which had neither been searched nor discussed so far, and because claim 1 as

amended still lacked an inventive step in view of D4 and D3 for the same reasons as claim 1 of the main request.

The respondent argued that auxiliary request III was filed in direct reaction to the Board's preliminary opinion in its communication under Article 15(1) RPBA that claim 1 as granted lacked novelty in light of D1. This opinion of the Board had taken the respondent by surprise. The feature added to claim 1 defined weight ranges for the auto-igniting agent and the gas generating agent to make clear that - as repeatedly submitted throughout the proceedings - only a small amount of auto-igniting agent was used in order to guarantee the cleanliness of the exhaust gas. This feature further distinguished the invention from D4 and was not rendered obvious by the teaching of D3.

(e) Auxiliary request VI - Inventive step

Respondent's case:

In addition to features (f) and (g) of claim 1, D4 fails to disclose added feature (h). This feature clearly implies that only a small amount of auto-igniting agent is used to form a film-like layer and thereby guarantee that the exhaust gas remains clean. It is neither disclosed nor suggested in D3 and is not a standard measure in the relevant art.

Appellant's case:

The subject-matter of claim 1 still lacks an inventive step in view of D4 and D3 for the same reasons as claim 1 of the main request.

It cannot be derived from the language of the claim that the invention guarantees that the exhaust gas remains clean. In fact, it follows from paragraph 20 of the application as published that the range of 3 to less than 10 mg is an arbitrary selection of the broad range of 3 to 100 mg.

In light of the similar shapes and sizes of the gas generator shown in figure 1 of D4 and that shown in figure 1 of the patent, when combining the teachings of D4 and D3, the skilled person would inevitably arrive at a thin film-like layer of auto-igniting agent with a weight falling within the claimed range of 3 to less than 10 mg. This choice of this weight range is in fact dictated by the confined space available for installing the gas generator and by considerations of reducing costs as well as health and environmental risks. For instance, D1 already discloses the use of 10 mg of auto-igniting agent in a micro gas generator (page 29, line 24).

Reasons for the Decision

1. Main request - Article 100(c) EPC
 - 1.1 The appellant contended that claim 1 introduces subject-matter which extends beyond the teaching in the application documents as originally filed because it comprises feature (f) but it does not require the further feature that the holder and the squib are prepared separately and integrated by caulking.
 - 1.2 The Board shares the view of the opposition division and the respondent that this objection is not persuasive. In the application as published (EP 1 541 958 A1), feature (f) is disclosed on page 3, lines 37

and 38, on page 3, lines 43 and 44 and in figure 1. It is the gist of the application that this feature is necessary to attain the desired auto-ignition function. Even though it follows from line 45 on page 3 that, in figure 1, the holder 1 and the squib 2 are prepared separately and integrated by caulking, it is apparent that this further feature is not essential for achieving the auto-ignition function, and this is confirmed by the teaching on page 3, lines 38 and 39. Consequently, there is no unallowable intermediate generalisation, contrary to the appellant's view.

2. Main request - Inventive step

2.1 The parties agree that the micro gas generator as disclosed in D4 is a realistic starting point for the assessment of inventive step. The Board shares this view.

2.2 D4 discloses, in figure 1, a micro gas generator 10 for use to activate a seat belt pre-tensioner and comprising (see page 4, lines 18 to 26):

- a gas generating agent (gas generant composition 26);
- a cup body for filling the gas generating agent therein (propellant cup 25 of housing 12);
- a squib for igniting the gas generating agent (initiator 22); and
- a holder fixedly sealing the squib in the cup body (initiator retainer 24).

2.3 It is stated on page 7, lines 20 to 22 of D4 that, if need be, a piece of preformed auto-igniting agent can be insert molded against the bottom of the cup body (see auto-ignition material 36 in figure 5).

2.4 The Board shares the view of the parties that the subject-matter of claim 1 differs from this embodiment disclosed in D4 by the features

f2) that the auto-igniting agent layer is (also) provided "on the side of the inner surface of the cup body", and

g) that the auto-igniting agent layer is "formed by applying a solution containing the automatic igniting agent on the inner surface of the cup body and then drying".

2.5 It is apparent that distinguishing feature (f2) has the effect of shortening the auto-ignition time when the micro gas generator is exposed to a high temperature caused by a fire accident. This is confirmed by the results of comparative bonfire tests which simulated a fire accident (see table 1 and paragraphs 35 to 37 in the patent specification). Thus, starting from D4, the technical problem objectively solved by feature (f2) is how to improve the auto-ignition properties of the micro gas generator.

2.6 D3 concerns a gas generator for inflating the air bag of a vehicle seat, comprising a cylindrical vessel, a gas generating agent disposed therein, a boosting agent for igniting the gas generating agent, and an auto-igniting agent having an ignition temperature lower than that of the boosting agent (column 1, lines 11 to 17). D3 teaches that, by depositing the auto-igniting agent over almost the entire inner surface of the vessel, the auto-igniting agent ignites in an early stage when any part of the gas generator is heated upon a fire accident, thereby guaranteeing early ignition of the gas generating agent, irrespective of the direction of heat applied to the gas generator (column 1, line 48 to column 2, line 2; column 3, lines 8 to 15). Figure 1

of D3 shows a preferred embodiment of the gas generator, with an auto-igniting agent 3 coated over the entire inner surface of the vessel 1 (column 2, lines 19 and 20).

- 2.7 The skilled person would see the advantages of the general teaching of D3 and recognise that the above technical problem could be solved by applying a layer of auto-igniting agent over almost the entire inner surface of the cup body of the gas generator of D4 in accordance with the teaching of D3. He would have no practical difficulty in applying the auto-igniting agent accordingly, by means of a well known coating technique such as spraying, brushing or centrifugal coating. After doing this, the skilled person would arrive at feature (f2) of claim 1.
- 2.8 Distinguishing feature (g) defines the claimed gas generator by referring to the method by which the layer of auto-igniting agent is formed. It is not credible that this feature leads inevitably to a discernible difference in the auto-igniting agent layer of the invention compared to that, that the skilled person would obtain when applying the general teaching of D3 in the above defined manner. In fact, in doing this, and using common general knowledge, the skilled person would immediately recognise that the auto-igniting agent can be easily applied as a slurry or suspension by spraying, brushing or centrifugal coating (see e.g. in D1 the pyrotechnic layers 40 and 41, page 18, lines 13 to 18 and page 25, lines 5 to 9). The wording of feature (g) does not imply that the auto-igniting agent layer is formed into a thin film, contrary to the respondent's view, and there is no evidence on file to support the respondent's assertion that a layer formed

by spraying a slurry or suspension would inevitably be thicker than a layer formed according to feature (g).

- 2.9 The fact that D3 discloses a coating of auto-igniting agent, while D4 discloses an insert molded piece of auto-igniting agent, would not hinder the skilled person from considering the teaching of D3 and applying it to the gas generator of D4. In fact, the invention of D3 aims to improve upon a prior art gas generator wherein the auto-igniting agent is disposed only at one end face of the vessel (see column 1, lines 36 to 51 of D3), and this arrangement is similar to that disclosed in D4.
- 2.10 The skilled person would also not be deterred from combining the teachings of D4 and D3 by the fact that the gas generator shown in figure 1 of D3 differs from the gas generator shown in figure 2 of D4 in that it comprises a central boosting agent 4 disposed along the axial center of the vessel 1. When seeking to solve the above technical problem, the skilled person would follow the general teaching of D3 to improve the auto-ignition function of a gas generator, rather than consider combining the structural features of the preferred embodiments of gas generators as illustrated in D4 and D3.
- 2.11 The respondent alleged that, in addition to fast auto-ignition upon a fire accident, the claimed gas generator provides for a clean exhaust gas because it uses only a small amount of auto-igniting agent that has been applied in the form of a thin film-like layer. However, claim 1 is silent about the amount of auto-igniting agent and it covers embodiments wherein a relatively large amount of auto-igniting agent is used in the form of a relatively thick layer covering the

entire inner surface of the cup body. Thus, the alleged cleanliness of the exhaust gas is not credibly obtained over the whole scope of the claim and hence cannot be used for formulating the objective technical problem.

2.12 It is stated on column 3, lines 4 to 6 of D3 that the auto-igniting agent preferably consists of smokeless powder that ignites at about 150 to 200°C. In its submission dated 15 June 2015 the respondent argued that such a powder could be deposited as such, i.e. in a dry form, rather than as a slurry or suspension. Even if it could, it does not detract from the fact that the obvious way is to use a slurry or suspension.

3. Auxiliary request III - Admissibility

3.1 Under Article 13(1) RPBA any amendment to a party's submissions after it has filed its statement of grounds of appeal or reply may be admitted and considered at the Board's discretion. Article 13(3) RPBA adds that amendments made after oral proceedings have been arranged are not admitted if they raise issues which the Board or the other party or parties cannot reasonably be expected to address without an adjournment of the oral proceedings. In addition, it is established case law that amended claims belatedly filed at such a stage, in particular during oral proceedings, must be clearly allowable in order to be admitted into the proceedings. Hence, it must be immediately apparent to the Board, with little investigative effort on its part, that the amendments made successfully overcome all outstanding objections under the EPC, without giving rise to new ones.

3.2 The respondent filed auxiliary request III with letter dated 14 September 2017, allegedly in reaction to the

Board's communication under Article 15(1) RPBA in preparation of the oral proceedings.

3.3 The Board exercised its discretion not to admit this request into the proceedings for the following reasons (Article 13(1) RPBA):

3.3.1 The Board does not share the respondent's view that the filing of this request was justified by the Board's communication. The communication did not raise any new issues but merely established the factual and legal framework of the case, and indicated the preliminary and non-binding opinion of the Board that, among other things, the respondent's main request lacked novelty in view of D1, for the reasons given by the appellant. Thus, the filing of auxiliary request III was belated.

3.3.2 Claim 1 as amended differs from claim 1 of the main request by the addition of the feature that "the weight of the automatic igniting agent layer (4) is within the range of 3 mg to 100 mg for a weight of the gas generating agent in the range of 300 mg to 2000 mg". This feature has been taken from the description (paragraphs 21 and 25 of the patent specification). It has presumably not been searched since it was not claimed either in the application as filed or in the patent as granted. It raises new issues which have not been discussed so far in the opposition or appeal proceedings.

3.3.3 Claim 1 as amended apparently still lacks an inventive step in view of D4 and D3. The added feature defines broad ranges for the weight of the auto-igniting agent and that of the gas generating agent. It is not apparent how these broad ranges can further distinguish the claimed invention from the gas generator of D4,

when coated with an auto-igniting agent layer as taught in D3. Contrary to the respondent's view, the weight ranges do not imply that only a small amount of auto-igniting agent is used. The upper value of 100 mg for the weight of auto-igniting agent defines a large amount of this agent. As shown by the appellant, claim 1 covers an embodiment wherein the weight ratio of auto-igniting agent to gas generating agent can be as high as 33,33%. Clearly, this is not a relatively small amount of auto-igniting agent.

4. Auxiliary request VI- Admissibility

4.1 Auxiliary request VI corresponds to auxiliary request III filed with the respondent's reply to the grounds of appeal.

4.2 In its written submissions, the appellant objected to the admission of this request into the proceedings. In its communication pursuant to Article 15(1) RPBA the Board addressed this objection and expressed its intention to take this request into consideration, in particular because it had already been admitted into the opposition proceedings (see point 12.2.2 of the communication).

4.3 In the oral proceedings, the appellant indicated that it no longer contested the admissibility of this request. The Board sees no reason to depart from the preliminary opinion expressed in the communication. Hence, auxiliary request VI is admitted into the proceedings.

5. Auxiliary request VI - Amendment

5.1 Claim 1 differs from claim 1 as granted by the added limitation that the weight of the auto-igniting agent layer is "3 mg to less than 10 mg" (feature (h)). The addition of this feature is supported by the teaching in paragraph 20 of the application as published.

5.2 In conclusion, the amendment to claim 1 meets the requirements of Article 123(2) and (3) EPC.

6. Auxiliary request VI - Inventive step

6.1 Claim 1 differs from claim 1 of the main request in that it includes feature (h). This feature is not disclosed in D4. The claimed subject-matter thus differs from the micro generator as disclosed in D4 in that it comprises features (f2), (g) and (h).

6.2 These distinguishing features mutually interact to achieve fast auto-ignition when the gas generator is exposed to a high temperature caused by a fire accident, whereby the clean exhaust gas can hardly be contaminated by the auto-igniting agent in view of the small amount. Thus, starting from D4, the objective technical problem to be solved is how to improve the auto-ignition function of the gas generator, without jeopardising the cleanliness of the exhaust gas.

6.3 Whilst it would be obvious for the skilled person to apply the general teaching of D3 to improve the auto-ignition function and thus arrive at distinguishing features (f2) and (g) (see point 2 above), he would not necessarily arrive at distinguishing feature (h). In fact, he is not provided with a clear motivation to use 3 to less than 10 mg of auto-igniting agent to form a

layer covering the bottom as well as the inner side of the cup body. On the contrary, the skilled person would rather consider using a larger amount of auto-igniting agent in order to improve the auto-igniting function.

- 6.4 The Board is not persuaded by the appellant's argument that feature (h) inevitably results from the shape and size of the gas generator as disclosed in D4. In fact, from the schematic representation of the gas generator given in figure 1 of D4, it is not possible to draw any conclusion as to the weight of auto-igniting agent that would be needed to form a layer over almost the entire inner surface of the cup body, as taught in D3. A comparison of figure 1 of D4 with figure 1 of the patent is of no help in this respect. Besides, it can be derived from the patent that a layer of auto-igniting agent covering the entire inner surface of the cup body can weigh up to 46 mg (see example 7), and this falls outside of the claimed range.
- 6.5 For the same reasons, the mere fact that, in use, the micro gas generator of D4 is positioned in a confined space does not necessarily imply that the skilled person would consider using only 3 to less than 10 mg of auto-igniting agent when coating almost the entire inner surface of the cup body, as taught in D3.
- 6.6 Finally, no evidence has been provided to support the assertion that the use of 3 to less than 10 mg of auto-igniting agent would be dictated by general cost, health and/or environmental considerations. In this respect, D1 discloses the use of 5 mg, alternatively 10 mg, of a pyrotechnic composition for igniting the gas generating agent of a squib for use in a micro gas generator (see figure 11 and page 22, line 25; figure 15 and page 29, line 24), whereby the pyrotechnic

composition preferably comprises normal lead styphnate (NLS) or zirconium/potassium perchlorate (ZPP) as pyrotechnic material (page 17, lines 34 to 36; page 18, lines 19 to 21; page 19, lines 2 and 3). This pyrotechnic composition is not an auto-igniting agent in the sense of claim 1, which is provided in the cup body of the gas generator and is implicitly adapted to ignite automatically at an early stage when the cup body is heated upon a fire accident, thereby guaranteeing that the gas generating agent is ignited before the cup body is damaged, weakened or made brittle.

- 6.7 In conclusion, when starting from D4, the subject-matter of claim 1 involves an inventive step in the sense of Article 56 EPC.
7. For the reasons set out above, the grounds for opposition raised by the appellant, namely those of unallowable amendment before grant and lack of inventive step, do not prejudice the maintenance of the patent as amended according to auxiliary request VI.
8. The description has been brought into conformity with the amended claims.
9. Right to be heard - Lack of reasoning
- 9.1 In a submission dated 16 July 2014, in the proceedings before the opposition division, the appellant raised an objection of lack of inventive step against claim 1 as granted, starting from D1 as closest prior and combining it with common general knowledge. This attack was discussed with the parties during the oral proceedings before the opposition division and their respective arguments are summarised in the written

decision of the opposition division (see points 4.1.1 and 4.2.1).

9.2 However, the written decision is silent as to why the opposition division did not find this attack convincing. Hence, the decision is not sufficiently reasoned in this respect and this constitutes a substantial procedural violation (Article 113(1) EPC).

9.3 This could be sufficient reason for setting aside the contested decision, as requested by the appellant. However, for the reasons given above, this is not the only reason for doing so.

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 as amended in the following version:
 - claims 1 to 7 of auxiliary request VI filed with letter dated 14 September 2017;
 - description pages 2 to 4 and 6 filed in the oral proceedings before the Board and description pages 5 and 7 of the patent specification; and
 - figures 1 to 4 of the patent specification.

The Registrar:

The Chairman:



C. Spira

G. Ashley

Decision electronically authenticated