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**Datasheet for the decision
of 30 January 2025**

Case Number: T 0515/23 - 3.3.02

Application Number: 15193538.4

Publication Number: 3034153

IPC: B01D53/14

Language of the proceedings: EN

Title of invention:

METHODS AND SYSTEMS FOR DEACIDIZING GASEOUS MIXTURES BY MEANS
OF AN ABSORBENT WITH AN ORGANIC PHASE AND A CARRIER PHASE

Applicant:

Hu, Liang

Headword:

Relevant legal provisions:

EPC Art. 123(2), 76(1), 113(1), 111(1)
RPBA 2020 Art. 11

Keyword:

Amendments - extension beyond the content of the parent
application as filed - extension beyond the content of the
application as filed
Right to be heard - substantial procedural violation

Decisions cited:

Catchword:



Beschwerdekammern
Boards of Appeal
Chambres de recours

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Case Number: T 0515/23 - 3.3.02

D E C I S I O N
of Technical Board of Appeal 3.3.02
of 30 January 2025

Appellant:
(Applicant)

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Lexington, KY 40506 (US)

Representative:

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Decision under appeal:

**Decision of the Examining Division of the
European Patent Office posted on 6 September
2022 refusing European patent application No.
15193538.4 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman M. O. Müller
Members: S. Bertrand
R. Romandini

Summary of Facts and Submissions

- I. The appeal by the applicant ("appellant") lies from the examining division's decision to refuse European patent application No. 15 193 538.4 on the basis of the claims of the main request and auxiliary request 1, both filed on 8 June 2022.
- II. The application is concerned with the provision of a method for deacidifying a gaseous mixture comprising an acid gas.
- III. In the impugned decision, the examining division's conclusions included that claim 1 of the main request and auxiliary request 1 did not meet the requirements of Articles 76(1) and 123(2) EPC.
- IV. In its statement of grounds of appeal, the appellant disputed the examining division's decision and submitted claim sets according to auxiliary requests 2 and 3. It further submitted that the appellant's right to be heard had been violated during the oral proceedings before the examining division.
- V. The board summoned the appellant to oral proceedings as per its request and issued a communication under Article 15(1) RPBA.
- VI. Oral proceedings before the board were held by videoconference on 30 January 2025.
- VII. The appellant requested that the decision under appeal be set aside and the case be remitted to the examining division since a substantial procedural violation occurred during the oral proceedings before the examining division.

Alternatively, the appellant requested that the case be remitted to the examining division for further prosecution should any of the sets of claims of the main request and auxiliary requests 1 to 3 meet the requirements of Article 123(2) EPC. The sets of claims of the main request and auxiliary request 1 were filed on 8 June 2022 and the sets of claims of auxiliary requests 2 and 3 were filed with the statement of grounds of appeal.

Reasons for the Decision

Right to be heard - Article 113(1) EPC - Remittal - Article 111(1) EPC, Article 11 RPBA

1. In a letter filed one day before the oral proceedings, the representative informed the examining division that it would be accompanied by the applicant and inventor Mr Hu. Mr Hu attended only part of the oral proceedings before the examining division. According to the minutes (point 4 on page 4), Mr Hu joined the oral proceedings after the examining division had deliberated on the main request. The chairman announced that, according to the examining division, claims 1 and 8 of the main request did not meet the requirements of Articles 123(2) and 76(1) EPC. Then auxiliary request 1 was discussed (point 5 of the minutes). After the discussion, the examining division was of the opinion that the objections raised against the claims of the main request applied to the claims of auxiliary request 1 (point 5.1 of the minutes). From points 8 and 10 of the minutes, at some later stage, Mr Hu left the oral proceedings.

2. The appellant submitted in its statement of grounds of appeal that the right to be heard of Mr Hu had been violated, meaning that the case had to be remitted to the examining division for further prosecution and to provide Mr Hu the opportunity to present arguments.

The appellant submitted that, once Mr Hu had been able to connect, he was not given the opportunity to present arguments on auxiliary request 1 before the examining division during the oral proceedings. It submitted that not allowing the applicant to present arguments amounted to a severe violation of the right to be heard.

3. The board does not agree for the following reasons.

- 3.1 As set out above, the representative informed the examining division with a letter filed one day before the oral proceedings (7 July 2022) that the inventor/applicant Mr Hu would attend the oral proceedings. The relevant part of this letter reads as follows:

*"I [...] confirm that it is **not** intended for the inventor to speak. To the extent that the inventor is requested by the Examining Division to provide any technical input to the discussion, this will be under my control"* (emphasis added by the board)

- 3.2 According to the board, this statement does not represent a request for Mr Hu to be allowed to speak at the oral proceedings. In fact, if anything, this statement points to the opposite, namely that Mr Hu would not speak at the oral proceedings, unless explicitly asked by the examining division.

- 3.3 Furthermore, even though Mr Hu did not join the oral proceedings from the beginning, it is derivable from the minutes (points 1.2 to 1.4) that the representative

gave its consent to start the discussion on added subject-matter of the claims of the main request. The main request was discussed (point 2 and following sections of the minutes), and then the oral proceedings were interrupted for deliberation on added subject-matter of the claims of the main request (point 3). The representative did not request postponement of the deliberation so that Mr Hu could be heard on that issue. It was thus legitimate for the examining division to give its conclusion on added subject-matter of the claims of the main request (point 4 of the minutes). Again, the board sees no violation of the right to be heard on the main request.

For the discussion of auxiliary request 1, the appellant was given the opportunity to present arguments (point 5 of the minutes). Mr Hu thus had the opportunity to present arguments but did not. The chairman announced subsequently that the objections raised against the claims of the main request applied to the claims of auxiliary request 1. Thus, no violation of the right to be heard occurred in the discussion of auxiliary request 1.

After the examining division had stated that the features discussed for the main request under Article 123(2) EPC were equally present in auxiliary request 1 such that the corresponding objections under Articles 123(2) and 76(1) still applied (point 5.1 of the minutes), the representative could have asked that Mr Hu be allowed to rejoin the oral proceedings and present his arguments on auxiliary request 1. The appellant's representative refrained from doing so. As the appellant's representative did not request during the oral proceedings before the examining division that

Mr Hu be heard on auxiliary request 1, its complaint in appeal that Mr Hu was not heard is without substance.

3.4 The appellant's right to be heard was thus not violated during the oral proceedings before the examining division. This conclusion was set out by the board in its communication under Article 15(1) RPBA and was not challenged by the appellant.

3.5 The board thus decided to refuse the appellant's request to remit the case to the examining division for further prosecution (Article 11 RPBA and Article 111(1) EPC).

Main request

4. Added subject-matter - Claim 1 - Article 76(1) EPC

4.1 The application is a divisional application of earlier application 09 820 874.7 ("parent application").

Claim 1 of the main request reads as follows:

"1. A method for deacidizing a gaseous mixture comprising an acid gas, the process comprising:

*contacting the gaseous mixture with an absorbent in an absorption unit, wherein the absorbent comprises a carrier phase **which is an aqueous phase or hydrophilic phase** and an organic phase that is immiscible with the carrier phase;*

*allowing the organic phase to absorb the acid gas **chemically and physically through the interface between the gaseous mixture and the organic phase**, and convert the acid gas into an absorbed acid gas, so as to convert the absorbent into a gas-rich absorbent and to*

convert the gaseous mixture into a purified gaseous mixture;

allowing the absorbed acid gas to be transferred into the carrier phase **through the interface between the organic phase and the carrier phase, wherein the chemically absorbed acid gas is transferred in the chemically modified form**, so as to form a first gas-lean phase and a gas-rich phase in the gas-rich absorbent;

providing the gas-rich absorbent to a separation unit, so as to separate the first gas-lean phase from the gas-rich phase;

cycling the separated first gas-lean phase back into the absorption unit;

providing the separated gas-rich phase to a regeneration unit, so as to obtain the acid gas and a second gas-lean phase;

and cycling the second gas-lean phase back into the absorption unit;

wherein the organic phase comprises an amine and a component selected from the group consisting of an alkane, an unsaturated hydrocarbon, an alcohol, a glycol, an ether, an aldehyde, a ketone, a carbohydrate, an amino acid, or

wherein the organic phase comprises an alkanolamine and a component selected from the group consisting of an alkane, an unsaturated hydrocarbon, an alcohol, a glycol, an ether, an aldehyde, a ketone, a carbohydrate, an amino acid;

wherein the aqueous carrier phase is water or an aqueous solution comprising a component selected from the group consisting of an amine salt, an ammonium salt, an alkanolamine salt, an amino acid salt, potassium carbonate, potassium bicarbonate;

and wherein the hydrophilic carrier phase comprises a component selected from the group consisting of an amine salt, an ammonium salt, an alkanolamine salt, an amino acid salt, potassium carbonate, potassium bicarbonate;

and wherein the acid gas is selected from the group consisting of CO₂, SO₂, H₂S, COS, C₂S, mercaptans, fluorides, and HCl." (Emphasis added by the board; bold text representing addition compared to claim 1 of the parent application as filed.)

4.2 The parent application as filed does not directly and unambiguously disclose the subject-matter of claim 1 of the main request, specifically regarding:

- the definition of the organic phase
- the definition of the carrier phase
- the absorption of the acid gas

These features will be dealt with in turn in the following.

4.3 Definition of the organic phase

4.3.1 Claim 1 of the main request requires an organic phase defined in the claim as follows:

"the organic phase comprises

- *an amine and*
- *a component selected from the group consisting of an alkane, an unsaturated hydrocarbon, an alcohol, a glycol, an ether, an aldehyde, a ketone, a carbohydrate, an amino acid, or*

[...] the organic phase comprises

- *an alkanolamine and*
- *a component selected from the group consisting of an alkane, an unsaturated hydrocarbon, an alcohol, a glycol, an ether, an aldehyde, a ketone, a carbohydrate, an amino acid;"*

In the following, the amine or alkanolamine will be referred to as the "first component". The alkane, unsaturated hydrocarbon, alcohol, glycol, ether, aldehyde, ketone, carbohydrate or amino acid will be referred to as the "second component".

4.3.2 The appellant submitted that the organic phase referred to in claim 1 of the main request was disclosed in the combination of claim 2 and paragraph [0045] of the parent application as filed.

4.3.3 Claim 2 of the parent application as filed discloses that *"the organic phase comprises a component selected from the group consisting of an alkane, an unsaturated hydrocarbon, an alcohol, a glycol, an ether, an aldehyde, a ketone, a carbohydrate, an amine, an alkanolamine, and an amino acid"*.

Claim 2 of the parent application as filed thus discloses all the components given for the organic phase defined in claim 1 of the main request. However, it does not disclose a composition comprising, as a first component, an amine or an alkanolamine, and a second component selected from the group consisting of an alkane, an unsaturated hydrocarbon, an alcohol, a glycol, an ether, an aldehyde, a ketone, a carbohydrate and an amino acid.

The third sentence of paragraph [0045] of the parent application as filed reads as follows:

"In an embodiment of the present invention, the organic phase comprises an amine solution, including, but not limited to an alcohol, glycol or glycol ether solution of monoethanolamine, diethanolamine, piperazine, dibutylamine, or diisopropylamine."

This sentence discloses an amine solution, including one of monoethanolamine, diethanolamine, piperazine, dibutylamine and diisopropylamine as a first component and one of an alcohol, glycol and glycol ether as a second component. This sentence thus discloses an amine solution of specific amines or alkanolamines as a first component and some, but not all, of the second components required by claim 1 of the main request.

- 4.3.4 To arrive at the first component (amine or alkanolamine) of the organic phase considering claim 2 of the parent application as filed, a first selection of the amine or alkanolamine component out of the list given in claim 2 of the parent application as filed is required. Then a second selection of the number of components (two) is needed to arrive at a composition

comprising two components, as required by claim 1 of the main request. Finally, a third selection of compounds out of the list given in claim 2 of the parent application as filed is also needed to arrive at the list of compounds for the second component (an alkane, an unsaturated hydrocarbon, an alcohol, a glycol, an ether, an aldehyde, a ketone, a carbohydrate and an amino acid) required by claim 1 of the main request.

The appellant did not provide any pointer, and the board did not find any, for the combination of these selections in claim 2 of the parent application as filed. It follows that claim 2 of the parent application as filed is not a valid basis for the definition of the organic phase in claim 1 of the main request.

Paragraph [0045] of the parent application as filed, as set out above, discloses amine solutions comprising specific amines or alkanolamines and only two compounds (alcohol and glycol) out of the nine compounds required by claim 1 of the main request as the second component. Thus, it does not represent, alone or in combination with claim 2 of the parent application as filed, a suitable basis for the definition of the organic phase given in claim 1 of the main request.

- 4.3.5 It follows that the definition of the organic phase given in claim 1 of the main request adds subject-matter beyond the content of the parent application as filed.

4.4 Definition of the carrier phase

4.4.1 Claim 1 of the main request requires a carrier phase defined as follows:

"the aqueous carrier phase is water or an aqueous solution comprising a component selected from the group consisting of an amine salt, an ammonium salt, an alkanolamine salt, an amino acid salt, potassium carbonate, potassium bicarbonate;

[...] the hydrophilic carrier phase comprises a component selected from the group consisting of an amine salt, an ammonium salt, an alkanolamine salt, an amino acid salt, potassium carbonate, potassium bicarbonate;"

4.4.2 The appellant submitted that the components of the carrier phase referred to in claim 1 of the main request were disclosed in the combination of claims 6 and 13 and paragraph [0044] of the parent application as filed.

4.4.3 Claims 6 and 13 of the parent application as filed read as follows:

"6. The method of claim 1, wherein the carrier phase comprises a component selected from the group consisting of an amine salt, an ammonium salt, an alkanolamine salt, an alkaline salt, an alkaline-earth salt, an amino acid salt, and water."

"13. The method of claim 11 , wherein the carrier phase comprises a component selected from a group consisting of a monoethanolamine salt, a diethanolamine salt, a piperizine [sic] salt, a dibutylamine salt, a

diisopropylamine salt, a potassium bicarbonate, and a potassium carbonate."

Each of claims 6 and 13 of the parent application as filed discloses some, but not all, of the components given for the carrier phase defined in claim 1 of the main request.

The first two sentences of paragraph [0044] of the parent application as filed disclose that "[t]he carrier phase can be, for example, an aqueous phase or a hydrophilic phase. The carrier phase can comprise one or more aqueous solutions of a salt, including, but not limited to, alkaline salt solutions, ammonium salt solutions, alkanolamine salt solutions, alkaline-earth salt solutions. The carrier phase can also simply be water".

These two sentences disclose that the carrier phase can be water (one option as required by claim 1 of the main request) or an aqueous solution comprising a salt selected from an ammonium salt and an alkanolamine salt, i.e. two of the six salts required by claim 1 of the main request.

- 4.4.4 None of claims 6 and 13 and paragraph [0044] of the parent application as filed discloses the whole list of components of the aqueous solution of the carrier phase or the hydrophilic carrier phase given in claim 1 of the main request (an amine salt, an ammonium salt, an alkanolamine salt, an amino acid salt, potassium carbonate and potassium bicarbonate).

To arrive at this list, it is necessary to select four components (an amine salt, an ammonium salt, an alkanolamine salt and an amino acid salt) out of the

list of components given in claim 6 of the parent application as filed and to combine them with the selection of two components from the list of claim 13 of the parent application as filed (potassium carbonate and potassium bicarbonate). Paragraph [0044] of the parent application as filed is less relevant than claim 6 since it only discloses two components required by claim 1 of the main request (ammonium salt and alkanolamine salt).

The appellant did not provide any pointer, and the board did not find any, for the combination of these two selections in the parent application as filed. Therefore, the combination of claims 6 and 13 and paragraph [0044] of the parent application as filed does not represent a basis for the definition of the carrier phase.

Furthermore, claim 13 of the parent application as filed is only dependent on claim 11. Claim 11 requires that the acid gas be CO₂.

It follows that, in the parent application as filed, the potassium carbonate and potassium bicarbonate of claim 13 are only used in a method in which the acid gas is CO₂. In contrast, in claim 1 of the main request, the acid gas is selected from the group consisting of CO₂, SO₂, H₂S, COS, C₂S, mercaptans, fluorides and HCl, i.e. claim 1 of the main request does not limit the acid gas to CO₂.

This also represents a reason why claim 13 of the parent application as filed is not a basis for the definition of the carrier phase.

4.4.5 It follows that the carrier phase in claim 1 of the main request adds subject-matter beyond the content of the parent application as filed.

4.5 Absorption of the acid gas

Claim 1 of the main request requires "*allowing the organic phase to absorb the acid gas **chemically and physically through the interface between the gaseous mixture and the organic phase***" (emphasis added by the board). This option of absorbing the acid gas chemically and physically is to be selected out of the three options disclosed in paragraph [0047] of the parent application as filed: the acid gas can be absorbed by the organic phase physically, chemically or both physically and chemically.

Claim 1 of the main request further requires "*allowing the absorbed acid gas to be transferred into the carrier phase **through the interface between the organic phase and the carrier phase, wherein the chemically absorbed acid gas is transferred in the chemically modified form***" (emphasis added by the board).

This option of transferring the acid gas in the chemically modified form (requiring no further chemical modification) is to be selected out of the two options disclosed in paragraph [0049] of the parent application as filed. Paragraph [0049] discloses that the absorbed gas is then transferred into the phase through the interface between the organic phase and the carrier phase, **with or without further chemical modification.**

There are no pointers in the parent application as filed to make both selections.

Therefore, the absorption of the acid gas as defined in claim 1 of the main request is also not based on the parent application as filed.

4.6 The board notes that apart from the fact that there is no basis for the three features discussed above in isolation, there is no basis for the combination of all three features, i.e. of the combination of the organic phase, the carrier phase and the absorption of the acid gas as defined in claim 1.

4.7 In view of the above, the board concludes that claim 1 of the main request does not meet the requirements of Article 76(1) EPC.

5. Added subject-matter - Claim 1 - Article 123(2) EPC

The same conclusion is drawn with regard to the basis of claim 1 of the main request in the application as filed, which is identical to the parent application as filed. Thus, claim 1 of the main request does not meet the requirements of Article 123(2) EPC.

6. Consequently, the main request is not allowable.

Auxiliary request 1 filed on 8 June 2022

7. Added matter - Articles 76(1) and 123(2) EPC

7.1 Claim 1 of auxiliary request 1 differs from claim 1 of the main request in that the acid gas is limited to CO₂.

7.2 The reasons given for the lack of basis in the parent application as filed or the application as filed for the organic phase and the absorption of the acid gas as

defined in claim 1 of the main request also apply to claim 1 of auxiliary request 1, which comprises the same organic phase and refers to the same absorption of the acid gas.

8. With regard to the carrier phase, a two-fold selection of components in the parent application as filed or the application as filed, as set out in point 4.4.4, is still needed to arrive at the carrier phase of claim 1 of auxiliary request 1.
9. Lastly, there is no basis for the combination of the organic phase, the carrier phase, the absorption of the acid gas as defined in claim 1 of auxiliary request 1 and the CO₂ as the acid gas as required by claim 1 of auxiliary request 1.
10. Thus, the subject-matter of claim 1 of auxiliary request 1 extends beyond the content of the parent application as filed (Article 76(1) EPC) and the application as filed (Article 123(2) EPC).
11. Consequently, auxiliary request 1 is not allowable.

Auxiliary request 2 filed with the statement of grounds of appeal

12. Claim 1 of auxiliary request 2 differs from claim 1 of the main request in the organic phase. The organic phase comprises an amine and a component selected from the group consisting of an alcohol, a glycol and an ether or comprises an alkanolamine and a component selected from the group consisting of an alcohol, a glycol and an ether.

13. The reasons given for the lack of basis in the parent application as filed or the application as filed for the carrier phase and the absorption of the acid gas as defined in claim 1 of the main request also apply to claim 1 of auxiliary request 2, which comprises the same carrier phase and refers to the same absorption of the acid gas.
14. A threefold selection is still needed to arrive at the organic phase of claim 1 of auxiliary request 2:
- a first selection of the amine or alkanolamine component out of the list given in claim 2 of the parent application as filed or the application as filed
 - a second selection of the number of components (two)
 - a third selection of compounds out of the list given in claim 2 of the parent application as filed or the application as filed to arrive at the list of compounds for the second component, namely an alcohol, a glycol and an ether

The appellant did not provide any pointer, and the board does not find any, for the combination of these selections in the parent application as filed or the application as filed. Furthermore, in the same way as for the main request, a basis in the parent application as filed and the application as filed is missing for the combination of the organic phase, the carrier phase and the absorption of the acid gas, as defined in claim 1 of auxiliary request 2.

Therefore, the subject-matter of claim 1 of auxiliary request 2 extends beyond the content of the parent application as filed (Article 76(1) EPC) and the application as filed (Article 123(2) EPC).

15. For these reasons, auxiliary request 2 is not allowable.

Auxiliary request 3 filed with the statement of grounds of appeal

16. Auxiliary request 3 is a combination of auxiliary requests 1 and 2.

17. The reasons given above for auxiliary requests 1 and 2 apply to auxiliary request 3 (Articles 76(1) and 123(2) EPC).

18. Auxiliary request 3 is therefore not allowable.

Conclusion

19. None of the appellant's claim requests is allowable. The board reached this conclusion in its communication under Article 15(1) RPBA. The appellant did not provide any further submissions.

Order

For these reasons it is decided that:

1. The appeal is dismissed

The Registrar:

The Chairman:



A. Wille

M. O. Müller

Decision electronically authenticated