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Title of invention:
METHOD AND DEVICE FOR THE REVERSIBLE ADSORPTION OF CARBON DIOXIDE

Patent Proprietor:
Skytree B.V.

Opponent:
Maiwald GmbH

Relevant legal provisions:
EPC Art. 84, 123(2)

Keyword:
Amendments
Claims - clarity (yes)

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Case Number: T 0442/24 - 3.3.02

D E C I S I O N
of Technical Board of Appeal 3.3.02
of 9 October 2025

Appellant: (Patent Proprietor)	Skytree B.V. Science Park 408 1098 XH Amsterdam (NL)
Representative:	HGF HGF BV Benoordenhoutseweg 46 2596 BC The Hague (NL)
Respondent: (Opponent)	Maiwald GmbH Elisenhof, Elisenstrasse 3 80335 München (DE)
Representative:	Maiwald GmbH Elisenhof Elisenstraße 3 80335 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 19 March 2024 revoking European patent No. 3191211 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	M. O. Müller
Members:	P. O'Sullivan
	R. Romandini

Summary of Facts and Submissions

I. The appeal of the patent proprietor (hereinafter appellant) lies from the decision of the opposition division according to which European patent 3 191 211 was revoked.

II. An opposition was filed *inter alia* on the grounds for opposition under Article 100(a) EPC in combination with Articles 54 and 56 EPC, and Article 100(c) EPC.

III. According to the contested decision, the claims of the main request and auxiliary requests 1, 2 and 4 comprised added subject-matter. Auxiliary request 3 lacked clarity pursuant to Article 84 EPC in view of the term "directly".

IV. In a communication pursuant to Article 15(1) RPBA, the board provided its preliminary considerations.

V. Oral proceedings by videoconference took place as scheduled on 9 October 2025 in the presence of both parties.

VI. Requests relevant to the decision

The appellant (proprietor) requested that the contested decision be set aside and that the case be remitted to the opposition division for consideration of the grounds for opposition under Article 100(a) EPC, namely novelty and inventive step on the basis of the main request on which the decision of the opposition division was based and which was re-filed as main request with the appellant's grounds of appeal.

Alternatively, the appellant requested that the contested decision be set aside and that the board considers one of auxiliary requests 1 to 7 submitted with the appellant's grounds of appeal to meet the requirements of Articles 123(2) and 84 EPC and to remit the case on the basis of this auxiliary request for consideration of the grounds for opposition under Article 100(a) EPC, namely novelty and inventive step.

The respondent (opponent) requested dismissal of the appeal. It also requested that the case be remitted to the opposition division for further prosecution in the event that the board considers one of auxiliary requests 1 to 7 submitted with the appellant's grounds of appeal to meet the requirements of Articles 123(2) and 84 EPC.

VII. For the relevant party submissions, reference is made to the reasons for the decision set out below.

Reasons for the Decision

Main request - Amendments - Article 100(c) EPC

1. Background

The patent is concerned with a method and a device for the reversible adsorption of carbon dioxide from a gas mixture, namely a regenerative system comprising an adsorbent for capturing carbon dioxide reversibly from a gas stream, including ambient air (patent, paragraph [0001] and [0002]). This permits the production of gas mixtures having an increased carbon dioxide level without the need for highly pressurized equipment and/

or cryostatic devices, thus yielding cost savings. The method and device also have a lower volume requirement, higher stability, create no perceptible odours, and offer at least an equal or higher CO_2 capture performance compared to known processes using solid or liquid adsorbents (patent, paragraph [0017]).

1.1 Claim 1 of the main request reads as follows:

" *A device for the reversible adsorption of carbon dioxide from a gas mixture, comprising:*

i) *at least one adsorbent vessel* ***(13)*** *comprising ~~one or~~ a plurality of gas permeable cartridge**s*** ***~~vessels~~*** ***(7)*** *of an inert and dimensionally stable material* ***(7),***

~~and~~ *wherein each cartridge* ***(3)*** *compris**es~~ing~~*** *a suitable polymeric particular adsorbent* ***(19) for carbon dioxide*** *having a primary amino functionality at a total capacity of at least 2.0 eq./l, a surface area (BET) in the range of from 25 to 75 m^2/g, and an average pore diameter of 1 to 200 nm,* ***in a loose configuration, and***

wherein each cartridge (3) further comprises a gas permeable membrane (8) or mesh (18) with an average pore diameter in the range of from 0.01 - 0.25mm, for holding the adsorbent (19),

ii) means for desorption of adsorbed carbon dioxide from the adsorbent (19) in each cartridge (3) by a pressure, humidity and/or temperature adsorption swing in the cartridge (3), and

iii) means (17) for directing desorbed carbon dioxide from each cartridge; and

iv) a means (21) for heating the saturated adsorbent electrically to a temperature of from 60°C to 150°C."

(emphasis added by the board; strike though and bold text denoting deletion and addition compared to claim 1 of the application as filed)

1.2 Claim 1 of the main request is derived from device claim 1 of the application as filed. In line with the contested decision (points 3.1.1 and 3.1.3), the respondent submitted that the following features added subject-matter:

- a "gas permeable membrane (8) or mesh (18) with an average pore diameter in the range of from 0.01 - 0.25mm", and

- "a means (21) for heating the saturated adsorbent electrically to a temperature of from 60°C to 150°C".

1.3 A "gas permeable membrane (8) or mesh (18) with an average pore diameter in the range of from 0.01 - 0.25mm"

1.3.1 As basis for this feature in the application as filed the appellant referred to page 12, lines 27-29, which reads as follows:

"The cartridge further comprises a ***gas permeable membrane or division having an average pore diameter in the range of from 0.01 to 0.25 mm*** *to allow the gas mixture ample access to the adsorbent particles, while maintaining the adsorbent particles in place."*
(emphasis added by the board)

1.3.2 This passage refers to a "gas permeable membrane or **division**" having a specific average pore diameter, while claim 1 of the main request refers to "a gas permeable membrane (8) or **mesh** (18)" having the same average pore diameter.

1.3.3 It was a matter of dispute whether the replacement of "division" with "mesh" in this context found basis in the application as filed.

1.3.4 As basis for this replacement, the appellant referred to the reference to a mesh (18) in table 1 on page 5 of the application as filed, depicted in figure 6 as part of a "sorbent cartridge" in an arrangement for use in an aquarium (page 5, lines 18-20). A mesh was also disclosed in example 1 of the application as filed (page 17, line 29 - page 19, line 9).

1.3.5 The board disagrees essentially for the reasons provided by the respondent. The expression "gas permeable membrane or division" in the passage cited above requires interpretation to determine whether the replacement of "division" by "mesh" in claim 1 of the main request adds subject-matter. Specifically, this expression can be interpreted in two different ways, namely:

- the term "division" encompasses the term "gas permeable membrane" (hereinafter "inclusive or"), or

- a "division" is an alternative and is hence distinct from a "gas permeable membrane" (hereinafter "exclusive or")

1.3.6 As stated by the respondent, the second option cannot represent the correct interpretation: a gas permeable membrane is undoubtedly a "division", and not distinct therefrom. Therefore, "or" in the expression "gas permeable membrane or division" in the application as filed represents an "inclusive or". In contrast, a gas permeable membrane is not a mesh in the conventional sense, and vice versa. Consequently, "or" in the expression "gas permeable membrane or mesh" in claim 1 of the main request can only be understood as an "exclusive or".

1.3.7 Therefore, in the passage of the application as filed cited above, a "gas permeable membrane" and a "division" (which includes a gas permeable membrane) are both disclosed in association with the average pore diameter of from 0.01 to 0.25 mm. This passage of the application as filed does however not disclose a mesh, which, as set out above, is different from a membrane, let alone a mesh having an average pore diameter of from 0.01 to 0.25 mm.

1.3.8 Consequently, the term "mesh" in claim 1 of the main request only finds basis in the passages of the application as filed mentioned above in which it is mentioned explicitly. However, these passages lack a disclosure of the pore size of the mesh.

1.3.9 The appellant's further arguments failed to convince the board.

1.3.10 It was submitted that according to the passage cited above, a "gas permeable membrane or division" was characterised according to its function, namely "*to allow the gas mixture ample access to the adsorbent particles, while maintaining the adsorbent particles in*

place". A mesh was a component disclosed in the application as filed (as set out above) which could fulfil this functional feature. Hence, a permeable membrane, a division and a mesh all denoted the same feature to the skilled person, a mesh representing a specific type of permeable membrane or division.

1.3.11 The board acknowledges that the application as filed discloses a mesh to carry out the function stipulated in the above passage. However, this does not mean that the mesh is also disclosed with the average pore diameter range disclosed specifically for a gas permeable membrane or a division, with which it is not synonymous, as set out above.

1.3.12 The appellant also argued that although the pore size of the mesh was not explicitly disclosed in the application as filed, the skilled person would understand from the application as filed that it was to be understood as falling within the definition of a "gas permeable membrane or division", and thus having the average pore diameter stipulated in the passage cited above. In particular, the application as filed stated that the adsorbent beads preferably have a size in the range of from 0.25 to 1.5 mm (page 12, lines 12), and therefore, the mesh should have a smaller pore size in order to contain the beads of the adsorbent. This was also implied by the indication in example 1 that the metal mesh employed was "appropriately pored".

1.3.13 The board disagrees. The term "appropriately pored" refers to the mesh pores being sufficiently small to retain the adsorbent particles. However, it is no more than speculation to state that the disclosed adsorbent bead size of 0.25 to 1.5 mm would necessarily (and directly and unambiguously) imply that the average pore

diameter of from 0.01 to 0.25 mm indicated in the passage cited above would apply to the mesh. Even if this argument were to be accepted for the upper end of the pore diameter range of 0.25 mm (which the board finds tenuous at best), there is no basis for concluding that the lower end of the pore diameter range of 0.01 mm would apply to the mesh.

1.3.14 The appellant also argued that the term "appropriately pored metal mesh" used in example 1 of the application as filed indicated that the term "pore", even if not conventionally used in association with a mesh, was the language chosen in the application. Since the passage cited above represented the only disclosure in the application as filed of an average pore diameter range, said range would also be understood by the skilled person to apply to a mesh.

1.3.15 The board disagrees. While the skilled person may, on the basis of the application as filed, reasonably consider that some overlap between the average pore diameter in the passage cited above and the average pore diameter of the mesh (using the language of the application) exists, for the reasons set out above, there is no direct and unambiguous disclosure that both ranges are identical.

1.3.16 Consequently, there is no basis in the application as filed for the expression "mesh (18) with a pore diameter in the range of from 0.01 - 0.25mm" in claim 1 of the main request.

1.4 "Means for heating the saturated adsorbent electrically to a temperature of from 60°C to 150°C" (feature iv) of claim 1 of the main request; hereinafter "heating feature")

1.4.1 The appellant argued that the basis for the heating feature was found *inter alia* in claims 24 and 25, in combination with page 10, lines 15-16, page 15, lines 19-25 and claim 16 of the application as filed.

1.4.2 Claims 24 and 25 of the application as filed concern a process for separating carbon dioxide from a gas mixture by a pressure, temperature and/or humidity swing adsorption - desorption process comprising a step (a) directed to adsorbing carbon dioxide onto an adsorbent at a pressure P_1, a humidity H_1 and a temperature T_1, and a step (b) directed to desorbing at least part of the carbon dioxide adsorbed in step (a).

Step b) of claim 24 as filed reads as follows:

"desorbing at least part of the the [sic] *carbon dioxide adsorbed in step (a), to produce a stream enriched in carbon dioxide at a total pressure* P_2 ***and/or a temperature*** T_2*, and/or at a humidity level* H_2*,* ***at which temperature*** *and/or pressure the carbon dioxide has a lower adsorption constant with respect to the adsorbent* ***and therefore at least in part desorbs.***" (emphasis added by the board)

Dependent claim 25 in turn reads as follows:

"A process according to claim 24, wherein step (b) includes contacting the one or more cartridges with a fluid, preferably water, air or steam, at a temperature

in the range of from 60°C to 150°C, and optionally, at a reduced pressure; ***and/or heating the adsorbent in a cartridge through direct contact with a heating means to a temperature of from 60°C to 150°C.*** (emphasis added by the board)

1.4.3 Compared to the text of claim 25 in bold above, the heating feature of claim 1 of the main request includes the requirement that the heating of the adsorbent is performed *electrically*, and omits the requirement in claim 25 as filed that the heating is performed *through direct contact* with the heating means.

1.4.4 The respondent first submitted that process claims 24 and 25 as filed could not serve as basis for the heating feature in device claim 1 of the main request. In particular, the description and claims of the application as filed set a clear distinction between the devices and processes claimed. Claim 1 of the main request comprised features taken from both process and device claims, and therefore did not find basis in the application as filed. Electrical heating was disclosed in the application as filed for the device, but not for the process.

1.4.5 The board disagrees. As stated in the communication pursuant to Article 15(1) RPBA, it is derivable from the application as filed as a whole that the claimed process is performed in the claimed device: there are no two separate disclosures in the application as filed of a device and a process; rather they are intertwined. This is evident *inter alia* from page 1, lines 4-5 of the application as filed which states that the invention related to a method and device for the reversible adsorption of carbon dioxide from a gas mixture, as well as from page 3, lines 17 to 20 of the

application as filed, which also connects the process and device in the same way. There is no disclosure in the application as filed, and none was indicated by the respondent, from which one could deduce features that were intended for the device, but not for the process, and vice versa. In relation to electrical heating, for example, it would be illogical to construe the application as filed such that it covers a device with electrical heating means, but in contrast not a process using said electrical heating means. Furthermore, the fact that the claims of the application as filed are drafted to include claims directed to a device and claims directed to a process is nothing more than standard drafting convention: a process claim does not offer patent protection for a device, and vice versa. Therefore, in the absence of an explicit indication to the contrary, in the context of the present application as filed, the features of process claims 24 and 25 can be read onto the features of the device according to the application as filed.

1.4.6 Hence apart for the requirement in claim 1 of the main request that the heating of the adsorbent is performed *electrically*, and the omission in claim 1 of the main request of the requirement in claim 25 as filed that the heating is performed *through direct contact* with the heating means, claims 24 and 25 provide a basis for the heating feature of claim 1 of the main request.

1.5 Basis for heating the saturated adsorbent *electrically*

1.5.1 As stated above, the requirement in the heating feature of claim 1 of the main request that the heating of the adsorbent is performed electrically is not disclosed in claim 25 of the application as filed.

1.5.2 The appellant argued that basis for electrical heating of the adsorbent was provided by claim 16 and page 10, lines 15-16 of the application as filed.

1.5.3 The board agrees. Claim 16 of the application as filed, albeit referring to the device, stipulates that the device comprises a means for heating the saturated adsorbent electrically. Furthermore, on page 10, lines 15-16 it is stated that

"the regeneration of the adsorbent may be done by heat, more preferably by heating the saturated adsorbent ***electrically.***" (emphasis added by the board)

In this context, "regeneration" means desorption of the carbon dioxide from the adsorbent - see page 10, lines 9-14 of the application as filed, and hence the same context as intended in claim 25 of the application as filed.

1.5.4 Furthermore, as noted by the appellant, further support for the inclusion of "electrically" in the heating feature of claim 1 of the main request is provided by the part of the description as filed relating to the process of claim 25 (page 15, lines 19-22). Specifically, it is stated there that for the alternative of step b) which includes heating the adsorbent material in a cartridge directly, this may be done by having heating means present in the cartridge; the only example provided in this passage is metal wires which are electrically heatable. Hence, the application as filed provides basis for the inclusion of "electrically" in the heating feature of claim 1 of the main request.

1.5.5 The respondent's arguments to the contrary failed to convince the board.

1.5.6 The respondent submitted that both alternatives in claim 25 as filed were related to heating with a fluid; heating electrically therefore could not be read into claim 25 as filed from other parts of the application as filed. Specifically, claim 25 as filed concerned a process according to claim 24 as filed, wherein step (b) included two alternatives. The first alternative involved contacting the one or more *cartridges* with a fluid, preferably water, air or steam, at a temperature in the range of from 60°C to 150°C. In this alternative therefore, the *cartridges* were heated with a fluid externally. The second alternative in claim 25 as filed involved heating the adsorbent **in** a cartridge through **direct contact** with a heating means. This alternative also concerned heating with a fluid as for the first alternative, but the heating was direct and took place internally, i.e. in the cartridge. Electrical heating was thus not contemplated. Hence, the disclosures of electrical heating means in the application as filed cited by the appellant as basis could not be combined with claim 25 as filed.

1.5.7 The board disagrees for the reasons provided by the appellant. In particular, page 15, lines 15-25 as filed confirms that the respondent's interpretation of claim 25 of the application as filed is not correct. Specifically, this section concerns the process according to the invention and refers to step (b) thereof (page 15, line 19). A step (b) is disclosed in the claims of the application as filed only in relation to claims 24 and 25 as filed. Hence, it is unambiguous that step (b) on page 15 as filed refers to the process of these claims. On page 15 as filed, the two

alternatives of claim 25 as filed are addressed, starting with the first, which includes contacting the cartridges with a fluid (page 15, lines 15 - 18). As discussed above, the second alternative is then addressed. It is stated that this step can "advantageously be done by having heating means **present in the cartage** [sic]", and an example of such means is provided: metal wires or foils that are electrically heatable by resistance or induction. No further examples of how the second alternative can be performed are disclosed, let alone a disclosure that it is performed with a fluid inside the cartridge, as argued by the respondent. Hence, the second alternative refers to the heating means being present inside the cartridge, and electrical heating is explicitly contemplated as an embodiment of this alternative.

1.5.8 In a further argument, the respondent submitted that heating feature of claim 1 of the main request represented an intermediate generalisation over the combination of claims 16, 24 and 25 of the application as filed. Specifically, claim 25 as filed was dependent on claim 24 as filed, which distinguished between step (a) in which carbon dioxide is adsorbed, and step (b) in which it is desorbed. The heating step in claim 25 as filed proposed as basis for the heating feature in claim 1 of the main request was therefore inextricably linked to a desorbing step (b). Claim 1 of the main request was directed to a device comprising i) an adsorbing vessel (which corresponded to step (a) of claim 24) as filed, ii) a means for desorption (which corresponded to step (b) of claim 24 as filed). However, claim 1 of the main request left open whether the heating means in the heating feature is part of the means for desorption ii). Since the heating feature was on the same hierarchical level as means for desorption

ii), claim 1 of the main request was to be interpreted such that the heating feature is not part of means ii), and consequently does not mandatorily serve for desorption. Hence, claim 1 of the main request included within its scope embodiments in which the heating means of the heating feature was intended for a different purpose than desorption of carbon dioxide, and consequently contained added subject-matter.

1.5.9 The board does not find the respondent's argument convincing. Claim 1 of the main request is directed to a device for the reversible adsorption of carbon dioxide from a gas mixture. The means for desorption ii) in claim 1 of the main request includes temperature adsorption swing as one of the desorption means. The skilled person understands the concept of temperature swing adsorption - specifically, raising the temperature leads to desorption of the carbon dioxide. In the context of the claim, having a means iv), for heating the saturated adsorbent (i.e. adsorbent saturated with adsorbed carbon dioxide) electrically would only be understood by the skilled person in the context of claim 1 of the main request as a means for desorption of the adsorbed carbon dioxide.

1.6 Basis for the omission in the heating feature of the requirement of claim 25 as filed that the heating is performed through direct contact with the heating means

1.6.1 The appellant argued that it was not necessary to specify in the heating feature of claim 1 of the main request that the saturated adsorbent was heated *directly*, as direct heating was already implicitly indicated. Specifically, claim 1 of the main request was implicitly limited to direct heating in the heating feature by virtue of the interpretation of feature ii).

According to feature ii) of claim 1 of the main request, the means for desorption of adsorbed carbon dioxide from the adsorbent was "in each cartridge". Being "**in** each cartridge", the heating means was necessarily "direct", in that it came into direct contact with the adsorbent.

1.6.2 The board disagrees for the reasons set out by the respondent. Feature ii) of claim 1 of the main request can be interpreted in two different ways. Specifically, the expression "means for desorption of adsorbed carbon dioxide from the adsorbent in each cartridge" in this feature could reasonably be understood to mean that the means is located within each cartridge, as argued by the appellant. However, the expression could also equally reasonably be construed such that it is the adsorbent which is "in" each cartridge, i.e. as a means for desorption of adsorbed carbon dioxide from the adsorbent, said adsorbent being in the cartridge. Construed in this way, the location of the means for desorption of adsorbed carbon dioxide, and in particular whether it is direct or not, is undetermined. Since both interpretations are technically reasonable, claim 1 of the main request is to be interpreted broadly to include subject-matter covered by both. Hence, claim 1 of the main request includes embodiments in which feature ii) is not limited to direct heating.

1.6.3 The appellant also argued that there was basis for the omission of "directly" in claim 1 of the main request, and specifically referred to page 10, lines 15-16 as filed concerning the device, which did not require direct heating, as basis therefor. This passage reads as follows:

"*Preferably, the regeneration of the adsorbent may be done by heat, more preferably by heating the saturated adsorbent electrically*"

1.6.4 While the board acknowledges that this passage of the application as filed does not explicitly require direct heating, as set out above, basis for the heating feature of claim 1 of the main request is provided in part by claims 24 and 25 of the application as filed. More specifically, claim 25 as filed explicitly requires that the adsorbent is heated by direct contact with a heating means. Furthermore, as also addressed above, the passage of the description as filed relating to the second alternative in claim 25 as filed also required heating directly (page 15, lines 19-20). Furthermore, example 3 of the application as filed, which exemplifies an electrically heated regeneration arrangement and therefore represents an example of the heating feature of claim 1 of the main request, discloses direct heat transfer to the adsorbent, which is in direct contact with an electrically heated wire (page 20, lines 1 - 5). Hence, the description and claims of the application as filed comprise instances in which direct heating is required, and instances in which the requirement for direct heating is not stipulated. However, all of the disclosures of the description and claims as filed required as basis for the heating feature of claim 1 of the main request require direct heating. In particular, there is no basis for non-direct heating in combination with the temperature range stipulated in the heating feature of claim 1 of the main request.

1.6.5 Consequently, claim 1 of the main request includes embodiments which do not find basis in the application as filed, and therefore, also for this reason, contains added subject-matter.

1.7 The ground for opposition under Article 100(c) EPC therefore prejudices the maintenance of the patent as granted.

Auxiliary request 1 - Article 123(2) EPC

2. Compared to claim 1 of the main request, claim 1 of auxiliary request 1 was amended by the following deletion:

"gas permeable membrane (8) ~~or mesh (18)~~ with a pore diameter in the range of from 0.01 - 0.25mm"

Hence, the respondent's objection concerning the term "mesh" in claim 1 of the main request is overcome.

2.1 However, the conclusion of the board above that the heating feature of claim 1 of the main request adds subject-matter also applies to claim 1 of this request in which this heating feature is identical.

2.2 Consequently, for the same reason as provided for claim 1 of the main request in relation to the heating feature, claim 1 of auxiliary request 1 contains added subject-matter in contravention of Article 123(2) EPC.

Auxiliary request 2 - Article 123(2) EPC

3. Claim 1 of auxiliary request 2 differs from claim 1 of auxiliary request 1 in the heating feature, which was amended as follows:

"Means for heating the saturated adsorbent electrically to a temperature of from 60°C to ~~150~~ **100**°C"

3.1 During oral proceedings before the board, after announcing the board's conclusion in relation to claim 1 of auxiliary request 1, the board provided the preliminary view that auxiliary request 2 was not allowable for the same reason.

3.2 The appellant then stated that it had no further submission in relation to auxiliary request 2. It thereby did not disagree with the board's preliminary view that the same would apply to claim 1 of this request as for claim 1 of auxiliary request 1.

3.3 There is consequently no reason for the board not to maintain its preliminary view. Hence, claim 1 of auxiliary request 2 contains added subject-matter in contravention of Article 123(2) EPC.

Auxiliary request 3 - Article 123(2) EPC

4. Claim 1 of auxiliary request 3 differs from claim 1 of auxiliary request 1 in the heating feature, which was amended as follows:

"Means for heating the saturated adsorbent electrically to a temperature of from 60°C to ~~150~~ **80**°C"

4.1 During oral proceedings before the board, after announcing the board's conclusion in relation to claim 1 of auxiliary request 1, the board provided the preliminary view that auxiliary request 3 was not allowable for the same reason.

4.2 The appellant then stated that it had no further submission in relation to auxiliary request 3. It thereby did not disagree with the board's preliminary view that the same would apply to claim 1 of this request as for claim 1 of auxiliary request 1.

4.3 There is consequently no reason for the board not to maintain its preliminary view. Hence, claim 1 of auxiliary request 3 contains added subject-matter in contravention of Article 123(2) EPC.

Auxiliary request 4 - Article 123(2) EPC

5. Claim 1 of auxiliary request 4 differs from claim 1 of auxiliary request 1 in that feature iv) was amended as follows:

"*a means for **directly** heating the saturated adsorbent electrically to a temperature of from 60 °C to 150 °C*"

5.1 The appellant argued that the amendment of the heating feature of claim 1 to include the term "directly" overcame the conclusion of the board set out above in relation to claim 1 of auxiliary request 1.

5.2 The respondent disagreed. It argued that the inclusion of "directly" in the heating feature of claim 1 led to an intermediate generalisation of the disclosure of the application as filed. Specifically, direct heating of the adsorbent was only disclosed in the application as

filed in the context of electrically conducting elements, namely metal wires or foils which are in contact with the adsorbent (page 15, lines 19 - 25). This disclosure was absent from the heating feature of claim 1 of auxiliary request 4, and as a consequence, claim 1 of this auxiliary request included under its scope embodiments which did not find basis in the application as filed.

5.3 The board disagrees. As stated by the appellant, the relevant passage of the application as filed cited by the respondent reads as follows:

"*This may be advantageously be done by having heating means present in the cartage* [sic]*, e.g. metal wire or foils that are electrically heatable by resistance or induction*"

5.4 In this passage, metal wires or foils are explicitly provided merely as examples of direct heating means. Hence, the passage cannot be interpreted such that the heating means are limited to said metal wire or foils.

5.5 The respondent also argued that metal wires or foils were the only direct heating means disclosed in the application as filed. Claim 1 of auxiliary request 4 however included within its scope other possibilities, such as e.g. two electrodes with a current passing between them through a conductive adsorbent.

5.6 As stated by the respondent, the appellant is correct to state that claim 1 of auxiliary request 4 is not limited to metal wires and foils as the heating means. However, by virtue of the fact that metal wires and foils are provided in the application as filed only as examples of a direct heating means, the application as

filed is also not limited in this regard. Hence, the absence of metal wires or foils as the heating means in the heating feature of claim 1 of auxiliary request 4 does not represent an intermediate generalisation, and hence does not add subject-matter.

5.7 Consequently, the subject-matter of claim 1 of auxiliary request 4 meets the requirements of Article 123(2) EPC.

6. Clarity - Article 84 EPC

6.1 The respondent argued that the term "directly" added to the heating feature in claim 1 of auxiliary request 4 lacked clarity under Article 84 EPC.

6.2 The board acknowledges that the term "directly" does not appear in the granted claims, and hence is open to examination for clarity in view of G 3/14.

6.3 The respondent argued that the expression "directly heating the saturated adsorbent electrically" in the heating feature of claim 1 of auxiliary request 4 would be interpreted by the skilled person as direct electric heating of the adsorbent, implying that the adsorbent *itself* was electrically conductive and was heated by passing an electrical current through the adsorbent particles. This could be achieved by the application of a voltage, or by applying an electrical field to the adsorbent particles to induce a current in the particles. In contrast, having a heating means such as wires or foils in direct contact with the adsorbent (i.e. embedded in the adsorbent), as disclosed in paragraph [0073] of the patent, did not represent direct heating of the adsorbent in the context of the heating feature of claim 1 of auxiliary request 4: the

wires or foils were themselves heated electrically, but the adsorbent was heated via thermal conduction, radiation, or convection emanating from said wires or foils. This represented an indirect, non-electrical heating method.

6.4 The board agrees with the appellant that the only technically sensible meaning of "directly heating the absorbent electrically" is that the heat is generated by an electrical means in direct contact, i.e. at a location within the absorbent. Examples of such electrical means are stated in the patent (paragraph [0073]): metal wires or foils which are electrically heatable by resistance or induction. Being located within the adsorbent, such metal wires or foils create heat within the adsorbent and thereby heat it directly.

6.5 As set out by the appellant, it would be clear to the skilled person that the heating feature of claim 1 of auxiliary request 4 excludes the generation of heat outside of the cartridge, e.g. in a fluid, as argued by the respondent, and the transfer of this generated heat into the cartridge such that heat transfer from the fluid to the adsorbent occurs. Such heating would be indirect since the heat of the fluid, even if generated electrically, is not generated within the adsorbent, but outside of it, and is only subsequently transferred to the adsorbent. Alternatively, if heat were considered to be transferred "directly" from the fluid to the adsorbent inside the cartridge, then the adsorbent is heated "directly" by the fluid, but not electrically as required by the heating feature of claim 1 of auxiliary request 4.

6.6 The board acknowledges, as argued by the respondent, that both with direct heating with an electrical

heating means within the adsorbent (e.g. wires or foils) and with indirect heating via a fluid heat is transferred via radiation or convection to the adsorbent, either from the electrical heating means, or from the heated fluid. However, this does not detract from the fact that in the first situation, heat is generated both directly and electrically in the absorbent, while in the second situation, only one of these requirements can be fulfilled, as explained above.

6.7 The respondent also referred to electrically conductive adsorbent material either made from graphite or comprising graphite embedded inside the absorbent beads and heated via application of an electric field. The board acknowledges that such heating may be possible. However, the board fails to see why this would render claim 1 of auxiliary request 4 unclear. Indeed, this form of heating would also qualify as direct electric heating in the context of claim 1 in the same manner as with metal wires or foil: the heat is generated directly and electrically inside the cartridge at a location within the absorbent.

6.8 This understanding is also confirmed by the description of the patent. Specifically, paragraph [0073] of the patent states that "[a]lternatively, step (b) includes heating the adsorbent material in a cartridge **directly**" (referring to desorbing step (b) of the process set out in paragraph [0020] of the patent). Metal wires or foils that are electrically heatable by resistance or induction are then provided as an example of how this may be done. The metal wires or foils are preferably made from suitable material which is inert toward the adsorbent material and the formed carbon dioxide (patent, paragraph [0073]). Hence "directly" in

these paragraphs of the patent indicates that the (electrical) heating means is in direct contact with the adsorbent, i.e. inside the cartridge at a location within the adsorbent.

6.9 Claim 1 of auxiliary request 4 therefore meets the requirements of Article 84 EPC.

7. There were no further objections under Article 123(2) EPC or Article 84 EPC in relation to auxiliary request 4.

Consequently, the set of claims of auxiliary request 4 meets the requirements of Articles 123(2) and 84 EPC.

8. Remittal - Article 111 EPC and Article 11 RPBA

9. Both parties requested that if any request were to meet the requirements of Articles 123(2) and 84 EPC, the case be remitted to the opposition division for further prosecution, in particular based on the grounds for opposition under Article 100(a) EPC.

9.1 Pursuant to Article 11 RPBA, the board shall not remit a case to the department whose decision was appealed for further prosecution, unless special reasons present themselves for doing so.

9.2 In the present case, the decision under appeal is solely based on added subject-matter (Article 100(c) EPC or Article 123(2) EPC) and clarity (Article 84 EPC).

9.3 Since the grounds for opposition under Article 100(a) EPC are not part of the decision under appeal, these grounds also do not form the basis for appeal proceedings in accordance with Article 12 RPBA. This

constitutes a special reason in favour of remittal to the opposition division within the meaning of Article 11 RPBA.

9.4 Consequently, in line with the corresponding request of both parties, the board decided to remit the case to the opposition division for further prosecution.

Order

For these reasons it is decided that:

1. The appealed decision is set aside.

2. The case is remitted to the opposition division for further prosecution on the basis of the set of claims of auxiliary request 4 submitted with the statement of grounds of appeal.

The Registrar: The Chairman:

U. Bultmann M. O. Müller

Decision electronically authenticated