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**Datasheet for the decision
of 12 January 2023**

Case Number: T 3141/19 - 3.2.03

Application Number: 13162179.9

Publication Number: 2786858

IPC: B22F3/105, B29C64/153,
B29C64/386

Language of the proceedings: EN

Title of invention:

Method and apparatus for producing three-dimensional work pieces

Patent Proprietor:

SLM Solutions Group AG

Opponent:

Concept Laser GmbH

Headword:

Relevant legal provisions:

EPC Art. 54, 56

RPBA 2020 Art. 13(2), 12(6), 12(4)

Keyword:

Novelty - implicit disclosure (yes) - main request (no)
Amendment after summons - cogent reasons (no)
Late-filed request - admitted in first-instance proceedings
(no) - error in use of discretion at first instance (no)
Amendment to case - amendment overcomes objection (yes)
Inventive step - (no) - obvious solution

Decisions cited:

Catchword:



Beschwerdekammern

Boards of Appeal

Chambres de recours

Boards of Appeal of the
European Patent Office
Richard-Reitzner-Allee 8
85540 Haar
GERMANY
Tel. +49 (0)89 2399-0
Fax +49 (0)89 2399-4465

Case Number: T 3141/19 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 12 January 2023

Appellant: SLM Solutions Group AG
(Patent Proprietor) Estlandring 4
23560 Lübeck (DE)

Representative: Schicker, Silvia
Wuesthoff & Wuesthoff
Patentanwälte PartG mbB
Schweigerstraße 2
81541 München (DE)

Appellant: Concept Laser GmbH
(Opponent 3) An der Zeil 8
96215 Lichtenfels (DE)

Representative: Hafner & Kohl PartmbB
Schleiermacherstraße 25
90491 Nürnberg (DE)

Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted on
5 November 2019 concerning maintenance of the
European Patent No. 2786858 in amended form.

Composition of the Board:

Chairwoman D. Prietzel-Funk
Members: B. Miller
B. Goers

Summary of Facts and Submissions

I. European patent No. EP 2786858 ("the patent") relates to a method and an apparatus for producing three-dimensional work pieces by irradiating layers of a raw material powder with electromagnetic or particle radiation.

II. Three oppositions to the patent were filed on the grounds of Article 100(a) EPC, in conjunction with Articles 54 and 56 EPC, and Article 100(b) EPC.

During the opposition proceedings, the opposition by opponent 2 and the grounds for opposition pursuant to Article 100(b) EPC were withdrawn.

The opposition division concluded that the grounds for opposition under Article 100(a) EPC prejudiced the maintenance of the patent as granted, but that the patent amended on the basis of the claims of auxiliary request V, which had been submitted with the letter dated 13 October 2016, met the requirements of the EPC.

III. The interlocutory decision was appealed by the patent proprietor and opponent 3. Opponent 1 withdrew its opposition by a letter dated 28 February 2020. As the patent proprietor and the sole remaining opponent 3 are both appellants in the appeal proceedings, in the present decision the board will continue to refer to the remaining parties as the patent proprietor and the opponent, for the sake of simplicity.

IV. The following documents are of particular importance in the present decision.

E3: WO 98/24574 A1

E5: WO 92/08592 A1

V. With a letter dated 9 December 2022, the patent proprietor submitted auxiliary requests I to VI and withdrew all other previously filed auxiliary requests.

VI. Oral proceedings were held by video conference on 12 January 2023.

VII. At the end of the oral proceedings, the following requests were confirmed by the parties.

The patent proprietor requested that the decision under appeal be set aside and that the patent be maintained on the basis of the claims of the main request as granted, or alternatively that the patent be maintained in amended form on the basis of the claims of one of:

- auxiliary request I, filed with the letter of 9 December 2022
- auxiliary request II, filed with the letter of 9 December 2022
- auxiliary request III, filed as "auxiliary request I" with the statement of grounds of appeal and corresponding to auxiliary request II at the time of the decision under appeal
- auxiliary request IV, filed as "auxiliary request II" with the statement of grounds of appeal
- auxiliary request V, filed as "auxiliary request III" with the statement of grounds of appeal
- auxiliary request VI, filed with the letter of 9 December 2022

The opponent requested that the decision under appeal be set aside and that the patent be revoked. As a procedural point, the opponent further requested that auxiliary requests I to VI be deemed late-filed and therefore not admitted into the proceedings.

VIII. The independent claims of the requests at issue in this decision read as follows.

(a) Main request (claims as granted)

"1. Method for producing three-dimensional work pieces, the method comprising the following steps:

- supplying gas to a process chamber (12) accommodating a carrier (16) and a powder application device (14),
- applying a layer of raw material powder onto the carrier (16) by means of the powder application device (14),
- selectively irradiating electromagnetic or particle radiation onto the raw material powder applied onto the carrier (16) by means of an irradiation device (18), and
- discharging gas containing particulate impurities from the process chamber (12),

characterized in that the method further comprises the step of

- controlling the operation of the irradiation device (18) by means of a control unit (38) such that a radiation beam (22) emitted by at least one radiation source (24) of the irradiation device (18) is guided over the layer of raw material powder applied onto the carrier (16) according to a radiation pattern (56, 56') containing a plurality of scan vectors (V, V', V''), wherein the scan vectors (V, V', V''), in at least a section of the radiation pattern (56, 56', 56''), extend

substantially parallel to each other, and wherein at least every other scan vector (V , V' , V'') of the substantially parallel scan vectors (V , V' , V'') extends at an angle (γ , γ' , γ'') between 0° and 90° or between 270° and 360° with respect to a direction of flow (F) of a gas stream flowing through the process chamber (12)."

"8. Apparatus (10) for producing three-dimensional work pieces, comprising:

- a process chamber (12) accommodating a carrier (16) and a powder application device (14) for applying a raw material powder onto the carrier (16),
- a gas supply line (39) for supplying gas to the process chamber (12),
- an irradiation device (18) for selectively irradiating electromagnetic or particle radiation onto the raw material powder applied onto the carrier (16),
- a discharge line (42) for discharging gas containing particulate impurities from the process chamber (12),

characterized in that the apparatus further comprises

- a control unit (38) which is adapted to control the operation of the irradiation device (18) such that a radiation beam (22) emitted by at least one radiation source (24) of the irradiation device (18) is guided over the layer of raw material powder applied onto the carrier (16) according to a radiation pattern (56, 56', 56'') containing a plurality of scan vectors (V , V' , V''), wherein the scan vectors (V , V' , V''), in at least a section of the radiation pattern (56, 56', 56''), extend substantially parallel to each other, and wherein at least every other scan vector (V , V' , V'') of the substantially parallel scan vectors (V , V' , V'') extends at an angle (γ , γ' , γ'') between 0° and 90° or

between 270° and 360° with respect to a direction of flow (F) of the gas stream flowing through the process chamber (12)."

(b) Auxiliary request I

Claims 1 and 8 correspond to claims 1 and 8 of the main request, with the following feature added at the end.

"and wherein the scan vectors (V, V', V'') in the radiation pattern (56, 56', 56'') are oriented in dependence on the direction of flow (F) of the gas stream flowing through the process chamber (12) such that the absorption of radiation energy and/or shielding of the radiation beam (22) emitted by at least one radiation source (24) of the irradiation device (18) is reduced."

(c) Auxiliary request II

Auxiliary request II corresponds to auxiliary request I, but with claims 8 to 14 relating to an apparatus deleted.

(d) Auxiliary request III

Claim 1 is based on claim 1 of the main request, with the following feature added.

"- filtering the particulate impurities from the discharged gas stream, and"

Correspondingly, claim 8 is based on claim 8 of the main request, with the following feature added.

"- a filter (46) disposed in the discharge line (42) for filtering the particulate impurities from the discharged gas stream, and"

(e) Auxiliary request IV

Claim 1 is based on claim 1 of auxiliary request III with the further specification that

"the gas containing particulate impurities is discharged from the process chamber (12) by means of a conveying device (44)"

Correspondingly, claim 8 is based on claim 8 of auxiliary request III, with the following feature added.

"- a conveying device (44) which is operable so as to discharge gas containing particulate impurities from the process chamber (12),"

(f) Auxiliary request V

Claim 1 is based on claim 1 of the main request with the further specification that

"the gas containing particulate impurities is discharged from the process chamber (12) by means of a conveying device (44)"

and with the following feature added

"- filtering the particulate impurities from the gas stream discharged from the process chamber (12) by means of a filter (46) disposed in a discharge line (42) upstream of the conveying device (44), and"

Correspondingly, claim 8 is based on claim 8 of the main request, with the following features added.

"- a conveying device (44) which is operable so as to discharge gas containing particulate impurities from the process chamber (12),
- a filter (46) disposed in the discharge line (42) for filtering the particulate impurities from the discharged gas stream, wherein the filter (46) is disposed in the discharge line (42) upstream of the conveying device (44), and"

(g) Auxiliary request VI

Claims 1 and 8 correspond to claims 1 and 8 of auxiliary request V, with, in addition, the same features added as to auxiliary request I.

IX. The patent proprietor's arguments, where relevant to this decision, can be summarised as follows.

(a) Novelty over E3

E3 did not disclose an apparatus and a method for producing three-dimensional work pieces wherein the gas discharged from the process chamber contained particulate impurities.

Further, according to E3 any scan vector could be chosen. E3 did not disclose controlling operation of the irradiation device such that at least every other

scan vector extended at an angle between 0° and 90° or between 270° and 360° with respect to a direction of flow of the gas stream flowing through the process chamber. This feature of claim 1 had to be interpreted in the light of paragraph [0011] and Figure 4 of the patent, and implied that no scan vector was aligned with the direction of the gas flow.

(b) Admittance of auxiliary requests I, II and VI

Auxiliary requests I, II and VI were filed in response to an objection raised for the first time in the preliminary opinion of the board.

The new requests did not add further issues to be discussed, but instead resolved a disputed issue, namely how claims 1 and 8 should be interpreted with respect to the orientation of the scan vectors.

(c) Admittance of auxiliary request III

Auxiliary request III corresponded to auxiliary request II in the contested decision. Hence the request was not filed late, and should be considered in the appeal proceedings.

(d) Admittance of auxiliary requests IV and V

Auxiliary requests IV and V corresponded to auxiliary requests II and III, which had already been filed with the statement setting out the grounds of appeal. The requests addressed the reasoning in the contested decision concerning what had been auxiliary request II in the contested decision.

(e) Auxiliary request V - Article 123(2) EPC

The amendments to claims 1 and 8 were based on paragraph [0034] of the application as published.

(f) Inventive step starting from E3

Starting from E3, the objective technical problem to be solved was to improve the method for producing three-dimensional work pieces by providing the possibility of recirculating the process gas.

E3 did not disclose that the gas discharged from the process chamber contained impurities. Thus, the skilled person had no motivation to use a filter in the discharge line when aiming to provide an apparatus that is adapted to recirculate the process gas.

E5 disclosed various apparatuses for producing three-dimensional work pieces. In the context of the apparatus according to Figure 2, E5 disclosed that the gas circulated through the chamber and could then either be vented or recirculated. Hence E5 taught that filtering of gas was not required for recirculating the gas in an apparatus according to Figure 2. Moreover, the skilled reader would not take into account the filtering system of the apparatus according to Figures 4 and 5 of E5, since each apparatus shown in these figures provided a completely different gas flow from the apparatus of E3. Further, using filters was expensive and entailed further disadvantages.

X. The opponent's counter-arguments to each of the above points can be summarised as follows.

(a) Novelty over E3

E3 disclosed an apparatus and a method for producing three-dimensional work pieces in which a laminar gas flow was provided in a very flat process chamber. According to E3, impurities were carried away from the melting zone by the laminar gas flow. The gas exiting the process chamber inevitably contained at least a small amount of particulate impurities, such as smoke.

Moreover, E3 taught controlling operation of the irradiation device such that at least every other scan vector extended at an angle of 0° or 90° with respect to a direction of flow of the gas stream flowing through the process chamber. Similarly to the patent, the apparatus of E3 provided a predefined orientation of the gas flow due to the fixed position of the gas inlets and exhausts. Hence the scan vectors were controlled in relation to the gas flow orientation that was set, in the same way as defined in claim 1.

(b) Admittance of auxiliary requests I, II and VI

Auxiliary requests I, II and VI had been filed for the first time in appeal proceedings only after notification of a summons to oral proceedings, and were not justified by cogent reasons.

(c) Admittance of auxiliary request III

Auxiliary III had not been admitted during the opposition proceedings and should not be admitted into the appeal proceedings.

(d) Admittance of auxiliary requests IV and V

Auxiliary requests IV and V had not been presented during proceedings at first instance. They were deemed to have been filed late, and therefore should not be admitted into the appeal proceedings.

(e) Auxiliary request V - Article 123(2) EPC

The amendments to claims 1 and 8 constituted an intermediate generalisation of the teaching in paragraphs [0019] and [0034] of the application as published.

(f) Inventive step starting from E3

E3 disclosed an apparatus and a method for producing three-dimensional work pieces. The subject-matter of claims 1 and 8 differed from the disclosure of E3 only in that a filter was used in the discharge line of the apparatus upstream of the gas conveying device.

Using a filter in the discharge line was common practice for the skilled person when enabling recirculation of the gas.

As an example, this could be derived from E5, which disclosed an apparatus and a method for producing three-dimensional work pieces, wherein the apparatus comprised a filter in the discharge line.

Therefore it was obvious to use a filter in the apparatus according to E3 as well.

Reasons for the Decision

1. Applicable Rules of Procedure of the Boards of Appeal

The revised Rules of Procedure of the Boards of Appeal (RPBA 2020) entered into force on 1 January 2020. In the case at issue, both statements setting out the grounds of appeal were filed after 1 January 2020. Subject to the transitional provisions (Article 25 RPBA 2020), the revised version therefore applies to both appeals.

2. Main request - novelty

2.1 In line with the arguments presented by the parties, the following reasons focus on the novelty of the subject-matter of method claim 1. However, since independent device claim 8 comprises features of claim 1 as corresponding technical and functional features, the reasons also apply to claim 8.

2.2 E3 discloses an additive manufacturing apparatus comprising a process chamber with a gas inlet ("Schutzgaseinlaß 2") and a gas outlet ("Schutzgas-Auslaß 3"), see page 10, penultimate paragraph and Figure 1. A reservoir containment and the build chamber are disposed in a defined side-by-side arrangement inside the process chamber, see Figure 6B of E3.

Figure 1 of E3 shows that a process gas stream enters the process chamber through the gas inlet, flows through the process chamber (see arrows in Figure 1) and exits the process chamber through the gas outlet. A pump ("Pumpeinrichtung 25") is used to provide the gas flow, see page 14, 3rd paragraph.

It is uncontested that in the method of E3 the scan vectors alternate at an angle to the direction of the process gas stream of 0° and 180° or 90° and 270° respectively. This is apparent from the combination of the flow direction of the process gas stream relative to the build chamber indicated in Figure 6B and the disclosure of the scanning vector directions in Figure 4 of E3. In other words, according to E3 at least every other scan vector extends at an angle of approximately 0° or 90° with respect to the flow direction of the gas stream flowing through the process chamber, as required by claim 1.

It is further undisputed that, during operation of the apparatus of E3, particulate impurities are generated as a direct and inevitable result of the irradiation of the powder build material layer by the laser beam.

2.3 The patent proprietor argues that the subject-matter of claim 1 differs from the disclosure of E3 in that

i) the gas discharged from the process chamber comprises particulate impurities

and in that

ii) operation of the irradiation device is actively controlled in dependence on the direction of flow of the gas stream flowing through the process chamber.

Neither of these arguments by the patent proprietor is convincing.

2.4 Concerning feature i)

- 2.4.1 Claim 1 does not specify either the amount of particulate impurities contained in the discharged gas or the particle size or composition thereof. According to paragraph [0009] of the patent, the particulate impurities can comprise smoke particles.

Hence, feature i) is already disclosed if the gas discharged from the process chamber contains only a small amount of smoke particles.

- 2.4.2 The board is convinced that it is an inevitable result of the process described in E3 that the gas discharged from the process chamber also comprises at least a small amount of such smoke particles.

E3 discloses the following on page 8, last paragraph.

"Deshalb sollte durch eine geeignete Schutzgasführung die Oxidation der Schmelze, insbesondere durch den Luftsauerstoff, vermieden werden, sowie Verunreinigungen aus der Atmosphäre um die Bearbeitungszone herum entfernt werden. Dazu wird während des Aufschmelzens des metallischen Werkstoffpulvers über der Oberfläche des sich aufbauenden Formkörpers eine laminare Schutzgasströmung aufrechterhalten. Als Schutzgas kann zum Beispiel Stickstoff, Helium oder Argon verwendet werden. Eine ausreichende Strömung ist erforderlich, um nicht nur die sich im Bereich der Oberfläche befindlichen Gase, die eine Oxidation der entsprechenden Metalloberflächen bewirken könnten, sondern auch solche Gase, die in den Hohlräumen zwischen dem metallischen Werkstoffpulver eingelagert sind, zu entfernen. Diese Gase werden dann

ständig mit dem vorbeiströmenden Schutzgas abtransportiert ...".

Hence, E3 discloses that the laminar gas flow as illustrated by arrows 24 in Figure 1 of E3 prevents oxidation of the metallic particulate matter and removes debris ("Verunreinigungen aus der Atmosphäre") and released gases from the melting zone.

The protective gas flow in E3 is a laminar gas flow in order to prevent raw material powder in the powder bed from being swirled up, causing adverse effects on building of the work piece to be produced (see E3, page 9, lines 1 to 4). Nevertheless, the gas flow is strong enough for the gas that is released from cavities between the particles of the powder bed to be taken away by the laminar gas flow ("ständig mit dem vorbeiströmenden Schutzgas abtransportiert"). Hence, it is inevitable that smoke particles are also taken away by the laminar gas flow.

The laminar gas flow channel in the process chamber has a height of 20 mm (see page 14, third paragraph). As a result, the volumetric flow of protective gas that is guided close to and above the surface of the powder bed is kept low. Hence, to a large extent the laminar gas flow fills the volume of the process chamber (see page 9, first paragraph).

Since the process chamber of E3 is very flat, and substantially flush with a laminar gas flow that is close to the bed surface and strong enough to expel air that is retained in the cavities within the raw material powder, the board concludes that it is inevitable that a certain amount of small particulates

such as smoke particles will be removed from the process chamber with the laminar gas flow.

2.4.3 To conclude, the discharge line of the apparatus according to claim 8 is considered to be suitable for discharging gas containing particulate impurities from the process chamber.

2.5 Concerning feature ii)

2.5.1 As indicated above, Figure 4 of E3 demonstrates that the scan vectors in each section of the radiation pattern extend parallel to each other. With the pattern indicated in Figure 4 of E3, the control unit guides the radiation beam so that "at least every other scan vector 23" (i.e. every second scan vector) extends at an angle of 0° or 90° with respect to the direction of the laminar gas flow through the process chamber.

2.5.2 A further active control of the orientation of the scan vectors in dependence on the direction of the protective gas flow is not defined in claim 1, contrary to the argument made by the patent proprietor.

It is not disclosed in the patent specification, nor is it defined in claim 1, that the gas flow direction first needs to be determined before the direction of the scan vectors can be set in dependence thereon. Moreover, in the apparatus disclosed in the figures of the patent and also those of E3, the direction of the gas flow is predetermined, given the fixed positions of the gas inlet and gas exhaust openings. Thus, selection of the direction of scan vectors in E3 is in any case a selection in relation to the gas flow direction.

Furthermore, claim 1 does not require all the scan vectors to fulfil the requirements of claim 1 concerning the angle in relation to the direction of the gas flow, as shown for example in the embodiment of Figure 4 of the patent. Claim 1 only specifies that "at least every other scan vector" extends at an angle between 0° and 90° or between 270° and 360° with respect to a direction of flow of a gas stream. Figures 2 and 3 of the patent show embodiments according to which the parallel scan vectors extend in alternating directions, in line with claim 1.

E3 also discloses, in Figure 4, a scan pattern in which the parallel scan vectors extend in alternating directions. The scan vectors in E3 are thus controlled in the same manner as that specified by claim 1.

Hence, feature ii) does not distinguish the claimed subject-matter from the disclosure of E3.

2.5.3 It follows that the subject-matter of claims 1 and 8 as granted lacks novelty over E3, in line with the conclusions under point II.2.3.1.3 of the contested decision.

3. Auxiliary requests I to II - admittance

3.1 The patent proprietor filed auxiliary requests I to II after notification of a summons to oral proceedings before the board.

These requests are thus considered an amendment to the patent proprietor's appeal case pursuant to Article 13(2) RPBA 2020, and their admittance is at the discretion of the board.

The patent proprietor argued that there were exceptional circumstances, justifying the late filing by referring to an allegedly new and surprising argument in point 5.3.4 of the preliminary opinion of the board that had been presented in the annex to the notification.

This is not convincing. In point 5.3.4 of its preliminary opinion, the board indicated that a "further active control of the orientation of the scan vectors in reaction to the direction of the protective gas flow, in particular the direction of the gas flow **before** determining the orientation of the scan vectors, is not defined in claim 1 or claim 8, contrary to the argument of the patent proprietor."

This statement is neither new nor surprising. It addresses an argument made by the patent proprietor in its statement setting out the grounds of appeal. It takes up the corresponding counter-argument of the opponent as presented in its reply to the appeal of the patent proprietor, that claim 1 does not define an active control of the scan vectors in dependence on the gas flow.

Hence, no cogent reasons to file further auxiliary requests have been given.

- 3.2 In addition, the board notes that the features added to claim 1 of both auxiliary requests I and II, which are identical, do not define method steps of an active control of the scan vectors in dependence on the direction of the gas flow. Rather, the added features define a result to be achieved which is *prima facie* also obtained by the process of E3 (see last paragraph on page 8). Given the undefined reference for the

reduction in absorption and shielding that are now claimed, any of the scan vector orientations in E3, Figure 4 that fall under claim 1 also fall under the new feature. Thus, even if the request had been considered in the appeal proceedings, the proposed amendments were unsuitable for overcoming the novelty objection discussed in respect of the main request.

3.3 Therefore, the board does not admit auxiliary requests I and II into the proceedings under Article 13(2) RPBA 2020.

4. Auxiliary request III - admittance

Auxiliary request III, submitted as auxiliary request I with the statement setting out the grounds of appeal, corresponds to auxiliary request II in the contested decision. This request was not admitted into the proceedings by the opposition division. In exercising its discretion, the opposition division applied the criterion of lack of *prima facie* allowability.

Thus, admittance of this request is at the discretion of the board pursuant to Article 12(6), first sentence, RPBA 2020.

4.1 According to the patent proprietor, the amendments in claim 1 of auxiliary request III are based on paragraphs [0019] and [0034] of the application as published ("A-publication"), which correspond to the paragraphs on page 6, lines 10 to 19 and on page 10, lines 12 to 27 of the application as filed.

4.2 However, paragraph [0034] of the application discloses the filter only in combination with and in a specific position relative to a conveying device, i.e. upstream

of the conveying device. These limitations are not specified in claims 1 and 8.

Paragraph [0019] of the application inherently discloses the same arrangement as paragraph [0034], since the effect mentioned in paragraph [0019] ("the operation of the conveying device and hence the flow rate of the gas stream can be controlled independent of an operational state of a filter device filtering particulate impurities from the gas stream discharged from the process chamber") can *prima facie* only be achieved if the filter is located upstream of the conveying device.

Moreover, in paragraph [0019] the filter is disclosed in combination with a flow rate control which has been omitted from claim 1.

Hence, the amendment constitutes an unallowable intermediate generalisation over the disclosure of the application as filed.

4.3 Therefore, the board agrees with the conclusion of the opposition division that the amendments made to claims 1 and 8 *prima facie* generate problems with regard to the requirements of Article 123(2) EPC. The board does not admit auxiliary request III into the appeal proceedings, Article 12(6), first sentence, RPBA 2020.

5. Auxiliary requests IV to V - admittance

5.1 Auxiliary requests IV and V correspond to auxiliary requests II and III, which were filed for the first time with the statement setting out the grounds of appeal, and are thus an amendment to the patent proprietor's case pursuant to Article 12(4) RPBA 2020.

Their admittance is thus at the discretion of the board.

- 5.2 Claim 1 of auxiliary request IV is based on claim 1 as granted, with the following additional features.

"the gas containing particulate impurities is discharged from the process chamber (12) by means of a conveying device (44)"

"-filtering the particulate impurities from the discharged gas stream"

Claim 8 has been amended accordingly.

Since the location of the filter with respect to the conveying device is not specified in claims 1 and 8, the same objections also apply *prima facie*.

Therefore, the board does not admit auxiliary request IV into the appeal proceedings, Article 12(6), second sentence, RPBA 2020.

- 5.3 Claim 1 of auxiliary request V is based on claim 1 as granted, with the addition of the following features:

"the gas containing particulate impurities is discharged from the process chamber (12) by means of a conveying device (44)"

"- filtering the particulate impurities from the gas stream discharged from the process chamber (12) by means of a filter (46) disposed in a discharge line (42) upstream of the conveying device (44)"

Claim 8 has been amended accordingly.

These amendments have a literal basis in paragraph [0034] of the application as originally filed and are not considered an unallowable intermediate generalisation. Consequently, the amendments made to auxiliary request III overcome the reasons for not admitting the corresponding auxiliary request II that were raised by the opposition division. The request can thus be considered an appropriate response to the reasoning in the contested decision.

Therefore, the board admits auxiliary request V into the appeal proceedings under Article 12(4), second sentence, RPBA 2020.

6. Auxiliary request V - Article 123(2) EPC

As discussed above, the amendments to claims 1 and 8 have a literal basis in paragraph [0034] of the application as published.

The amendments to auxiliary request V thus fulfil the requirements of Article 123(2) EPC.

7. Auxiliary request V - inventive step

7.1 Both parties consider E3 an appropriate starting point for the assessment of inventive step.

7.2 The subject-matter of claims 1 and 8 differs from the method and device disclosed in E3 by the further step of filtering the particulate impurities from the gas stream that is discharged from the process chamber by means of a filter disposed in a discharge line upstream of the conveying device.

7.2.1 It is further undisputed that the objective technical problem can be formulated as improving the method for producing three-dimensional work pieces by providing the possibility of recirculating the gas (see paragraph [0034] of the patent).

7.2.2 E5 belongs to the same technical field of additive manufacturing as E3 and would therefore be considered by a skilled person trying to solve the problem.

E5 discloses, in Figures 4 and 5, an apparatus for selective laser sintering with a gas flow unit comprising a conveying device ("fan") and a filter disposed in the discharge line upstream of the conveying device. The filter is provided for the removal of, *inter alia*, smoke particulates and other debris from the gas exiting the chamber through the exhaust vents, see page 15, lines 20 to 23.

Hence, E5 proposes the same solution as that in claim 1 to solve the objective technical problem.

Confronted with the underlying problem, the skilled person would immediately understand that filtering the gas would be beneficial to the process of E3, since the removal of unavoidable impurities during the recirculation of gas prevents accumulation of impurities in the gas flow during the repetitive building cycles of an additive manufacturing process.

7.3 The patent proprietor contests this conclusion, for the following reasons.

- (a) E3 does not teach that the gas leaving the build chamber comprises any particulate impurities. Therefore, the skilled person would not have any reason to consider a gas filter.
- (b) The skilled person would not consider the apparatuses according to Figures 4 and 5 of E5, because the gas flow pattern provided here was substantially different from the gas flow pattern provided by the apparatus of E3.
- (c) E5 discloses, on page 7, lines 20 to 23 in the context of the apparatus according to Figure 2, that gas could be recirculated in the absence of a filter. Therefore, the skilled person would have no motivation to use a filter to solve the underlying problem.
- (d) It was expensive to install and to maintain gas filters. Furthermore, the use of gas filters provided further disadvantages such as the pressure drop and the risk of self-ignition of the filtered fine metallic particles.

These arguments are not convincing, for the following reasons.

7.3.1 Concerning (a)

As argued above (see novelty discussion for the main request), E3 discloses a manufacturing process in which particulate impurities are carried away from the melting zone by the process gas. As further explained above, it is inevitable, and immediately apparent to the skilled person, that at least some of the

particulate impurities remain in the process gas entering the discharge line. At the same time, the skilled person is aware of the need for the gas volume over the melting zone to be free of impurities, see also E3, page 8, last paragraph. Moreover, the removal of impurities from auxiliaries, such as the protective gas in E3, when recycling and reusing it in the same production process is considered a common technical principle in the art of production processes known to the skilled person.

Hence, the skilled person would not consider it possible to recirculate the process gas without taking the risk of the re-introduced gas contaminating the melting zone. Using a particle filter to filter contaminated gas is not therefore a far-fetched measure for the skilled person, but falls within the customary practice when aiming to recirculate gas flow.

7.3.2 Concerning (b)

The direction of the protective gas flow in the build chamber depends mainly on the position of the gas inlets and gas exhausts and is completely independent of the question of whether the process gas leaving the process chamber is simply vented, recycled or directly recirculated. The skilled person would not disregard apparatuses making it possible to provide the same laminar gas flow as that specified in E3 when confronted with the underlying problem. Hence, there is no prejudice which would prevent the skilled person from considering the teaching of Figures 4 and 5 of E5 in relation to the use of a filter in the discharge line.

7.3.3 Concerning (c)

The apparatus shown in Figure 2 of D5 is labelled "prior art". Therefore, the skilled person would not exclusively focus their attention on this teaching of E2.

However, even if the skilled person considered Figure 2 and the corresponding explanations on page 7 (indicating *inter alia* the possibility of gas "recirculation" without mentioning a filter), they would read the explanations in the relevant technical context and would conclude that a filter was indeed necessary.

Figure 2 of E5 is a schematic drawing of an apparatus which does not show all the essential components of the apparatus. For example, the heater or heat exchanger of a conditioning unit for heating or cooling the gas entering the process chamber, which on page 7, lines 17 to 20 of E5 is said to be a compulsory part, is not displayed in Figure 2. Thus, the statement on page 7, lines 20 to 23 of E5 does not provide a clear teaching for the skilled person that the gas flow in the apparatus according to Figure 2 can be recirculated without further modification.

Nor does the common general knowledge provide a corresponding teaching (see above). On the contrary, the skilled person expects the process gas to comprise impurities (see also page 15, lines 20 to 23 of E5) and so would conclude that a filter is necessary, in line with the embodiments of E5.

7.3.4 Concerning (d)

Gas filters were well known at the filing date of the patent. Hence, the skilled person was aware of how to install and handle gas filters, in particular including in the context of additive manufacturing apparatuses, as evident from E5. The common general knowledge regarding the costs of gas filters or drop in pressure would not have discouraged the skilled person from using filters, as argued by the patent proprietor, since not using filters for this purpose is not an option in view of the technical problem. In respect of the problem of self-ignition, no evidence was presented by the patent proprietor.

7.4 In summary, the subject-matter of claims 1 and 8 of auxiliary request V is obvious when starting from E3 and taking into account the teaching of E5. Therefore, it does not fulfil the requirements of Article 56 EPC.

8. Auxiliary request VI - admittance

The patent proprietor filed auxiliary request VI at the same time as auxiliary requests I and II, after notification of a summons to oral proceedings before the board.

The admittance of auxiliary request VI is thus also at the discretion of the board pursuant to Article 13(2) RPBA 2020.

Auxiliary request VI is based on auxiliary request V and contains the same additional amendments as auxiliary request I. The same considerations apply to the admittance of auxiliary request VI as to auxiliary request I.

Therefore, the board does not admit auxiliary request VI into the proceedings either, under Article 13(2) RPBA 2020.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairwoman:



C. Spira

D. Prietzel-Funk

Decision electronically authenticated