Internal distribution code:

(A) [-] Publication in OJ
(B) [-] To Chairmen and Members
(C) [-] To Chairmen
(D) [X] No distribution

Datasheet for the decision of 7 October 2019

Case Number: T 1033/14 - 3.2.05

Application Number: 04013326.6

Publication Number: 1486317

IPC: B29C67/00, B22F3/105

Language of the proceedings: EN

Title of invention:
Optimal dimensional and mechanical properties of laser sintered hardware by thermal analysis and parameter optimization

Patent Proprietor:
Aerojet Rocketdyne of DE, Inc.

Opponents:
EOS GmbH Electro Optical Systems
Siemens Aktiengesellschaft

Headword:

Relevant legal provisions:
EPC 1973 Art. 56, 100(b)
EPC Art. 123(2), 123(3)

This datasheet is not part of the Decision.
It can be changed at any time and without notice.

Keyword:
Amendments - added subject-matter (no) - broadening of claim (no)
Sufficiency of disclosure (yes)
Inventive step (yes)

Decisions cited:
T 0890/02

Catchword:

This datasheet is not part of the Decision.
It can be changed at any time and without notice.

Europäisches Patentamt
European Patent Office
Office européen des brevets

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 1033/14 - 3.2.05

D E C I S I O N
of Technical Board of Appeal 3.2.05
of 7 October 2019

Appellant: (Patent Proprietor)	Aerojet Rocketdyne of DE, Inc. 6633 Canoga Avenue Canoga Park, CA 91309 (US)
Representative:	Jennifer Waters Dehns St. Bride's House 10 Salisbury Square London EC4Y 8JD (GB)
Respondent I: (Opponent 1)	EOS GmbH Electro Optical Systems Robert-Stirling-Ring 1 82152 Krailling (DE)
Representative:	Peter Klein Prüfer & Partner mbB Patentanwälte · Rechtsanwälte Sohnckestraße 12 81479 München (DE)
Respondent II: (Opponent 2)	Siemens Aktiengesellschaft Werner-von-Siemens-Straße 1 80333 München (DE)
Representative:	Maximilian Gerstner Siemens AG Postfach 22 16 34 80506 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 19 February 2014 revoking European patent No. 1486317 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	M. Poock
Members:	P. Lanz
	G. Weiss

Summary of Facts and Submissions

I. The appeal was lodged against the decision of the opposition division posted on 19 February 2014 revoking European patent No. 1 486 317.

II. During the opposition proceedings, the opponents had raised the grounds for opposition according to Article 100(b) and Article 100(a) EPC 1973 in combination with Article 54(1) or Article 56 EPC 1973 (lack of novelty and lack of inventive step).

III. Oral proceedings were held before the board of appeal on 7 October 2019.

IV. The appellant (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the main request or first auxiliary request filed under cover of the letter dated 6 September 2019 or the second or third auxiliary requests filed under cover of the letter dated 30 August 2019.

V. The respondents I and II (opponents 1 and 2)requested that the appeal be dismissed.

VI. The documents referred to during the appeal proceedings included the following:

D1: EOS International User Meeting, 21 to 23 May 2003, Workshop: EOSINT P, slides of the presentation "Direct Manufacturing of Hearing Aid Shells: Process Control and Optimization" by Mr Mathey from Phonak Hearing Systems;

D1': German version of D1, filed on 8 August 2011;

D3: Kenneth G. Cooper: "Rapid Prototyping Technology", Dekker, New York, 2001, pages 1 to 11 and 118 to 137;

D4: DIN EN ISO 178, Kunststoffe - Bestimmung der Biegeeigenschaften;

D5: DIN EN ISO 527-1 und 527-2, Kunststoffe - Bestimmung der Zugeigenschaften;

D6: DIN EN ISO 1183-1, Plastics - Methods for determining the density of non-cellular plastics;

D8: Beaman et al.: "A New Direction in Manufacturing", Kluwer, Dordrecht, 1997, pages 226 to 243;

D9: Nelson et al.: "Improvements in SLS Part Accuracy", SFF Proceedings, September 1995, pages 159 to 169;

D13: US 5,659,478;

D21: A. Gebhardt: "Rapid prototyping: Werkzeuge für die schnelle Produktentstehung", Carl Hanser Verlag München Wien, 2nd edition 2000, pages 206 to 207.

VII. Claim 1 according to the main request reads as follows:

"A method for improving production parts (94), in particular aerospace production parts, produced from a rapid prototyping machine (70), wherein the rapid prototyping machine (70) makes use of a rapid prototyping material (74), a set of input data (42, 44) and an information set (50, 52, 54) having information pertaining to manufacturing factors involved in a previous build run of a production part, the method comprising:

executing a build run (58) that produces output components, comparing said output components to said set of input data (42, 44) to produce a resultant data set, said resultant data set including deviations between said set of input data (42, 44) and said output components (94, 96), incorporating said resultant data set into said information set, and tailoring (48) said information set to reduce said deviations between said set of input data (42, 44) and said output components (94, 96) as compared to at least one previous build run, characterized in that the output components include a combination of at least one production part (94) and at least one iterative improvement specimen (96), wherein said iterative improvement specimens (96) include one of Z-tensile arrays, density cubes, dimensional pyramids, flexural samples, and combinations thereof, and wherein the at least one production part and the at least one iterative improvement specimen are compared to said set of input data to produce the resultant data set."

VIII. The arguments of the appellant in the written and oral proceedings can be summarised as follows:

Added subject-matter and extension of scope

Claim 1 of the main request was based on original claims 1 and 5. The additional feature of comparing the production part and the iterative improvement specimen to the set of input data was originally disclosed in paragraph [0006] of the application as filed. It made explicit in the claim what was implicit before. Adding this feature to the claim limited the extent of protection. Moreover, the description according to the main request was unamended compared to the patent specification. Consequently, the main request was in

line with the requirements of Article 123(2) and (3) EPC.

Sufficiency of disclosure

The patent disclosed one way of carrying out the invention. In particular, paragraph [0026] indicated the machine to be used; the improvement of the production parts was explained in detail in Table 1 and paragraph [0038]. Thus, the relevant parameters were defined, the skilled person only had to adjust them in order to reduce possible deviations. Consequently, the disclosure of the claimed invention was sufficient.

Inventive step

It was contested that documents D1 and D1' were made available to the public before the priority date of the patent. Moreover, even under the assumption that they belonged to the state of the art, their content could not render obvious the subject-matter of claim 1 of the main request. Documents D1' or D1 contained two separate sections (see e.g. D1', slides relating to "Prozess Kontrolle" and "Prozess Optimierung"), neither of them disclosed the claimed design of the iterative improvement specimen (distinguishing feature (a)) or the aspect of comparing the production part and the iterative improvement specimen to the set of input data (distinguishing feature (b)). The latter feature had the technical effect of further improving the rapid prototyping process for manufacturing production parts. Neither document D1' nor any other prior art on file disclosed or suggested that the production part and the iterative improvement specimen manufactured in one build run were compared to the set of input data. In particular, this applied to slide "Prozess Optimierung

(4)" of document D1'. The claimed method related to improving the conditions during the production in a steady state. In contrast, document D21 referred to the calibration of the rapid prototyping machine before starting production. The fact that specific types of iterative improvement specimens were used in the method of claim 1 allowed for a reliable testing of certain properties. Documents D3, D8, D9 or D13, which the respondents had used as alternative starting points, were not suitable for serving as closest prior art. Documents D8 or D9 did not disclose the manufacturing of production parts. In particular, their teaching concerned the calibration of the machine and did not mention iterative improvement specimens. Document D13 was directed to the improvement of the part design cycle by modifying the model itself (see D13, top of column 6); it did not relate to a production process. Similarly, document D3 did not concern final products in the sense of the patent (see paragraphs [0008] and [0009] of the patent specification) but the prototyping of parts. It could not suggest that the production part and the iterative improvement specimen produced in one build run were compared to the set of input data, as defined in distinguishing feature (b). In view of the content of the documents on file, the subject-matter of claim 1 was based on an inventive step.

IX. The arguments of the respondents were essentially as follows:

Added subject-matter and extension of scope

Amended claim 1 constituted a generalisation of the detailed disclosure in paragraph [0006] of the application as filed. In particular, this paragraph specified that the input data included desired

dimensions and desired material characteristics, that the information set included a thermal analysis of a parts bed and fabricated parts, material characteristics of the rapid prototyping material, and/or build parameters, all of which were from previous build runs, known values, and/or computed values. This specific disclosure was unduly generalised in amended claim 1, which referred to unspecified input data and an information set pertaining to manufacturing factors involved in a previous build run. It was also noted that the wording of original paragraph [0006] was directed to a plurality of build runs while the claim required only one build run. Respondent II added that the amendment of original paragraph [0006] during the examination proceedings had shifted the scope of the claims, which was contrary to Article 123(3) EPC.

Sufficiency of disclosure

In claim 1 the input data were not specified; it was therefore not clear what was compared to what. Also the number of measurements was not defined. The claim was broad and unspecific. The object of the patent was to produce parts which were far superior to the prior art. It was not apparent how this could be achieved in only one build run. The patent did not contain any explanation in that respect. Moreover, the list of parameters given in Table 1 was not exhaustive. The skilled person was not able to reproduce the invention based on the information given in the patent. It was was not taught which parameter had to be changed and how this had to be done, although this was the crucial step in the claimed method. In particular, it was not explained how the measurements on the production parts and the iterative improvement specimens and possible deviation from the data set were used in the subsequent

steps. It had to be borne in mind that rapid prototyping was a complicated process, as shown in documents D8 and D9.

Inventive step

Documents D1 and D1' were made available to the public and therefore belonged to the state of the art. Document D1' (or D1, which has the same content), disclosed the manufacturing of a combination of production parts and iterative improvement specimens by rapid prototyping (see D1', slides "Prozess Charakteristiken (1)" and "Prozess Kontrolle (2)"). In the process of document D1', the iterative improvement specimens were compared to the input data set (see D1', slide "Prozess Kontrolle (3)") in order to establish recommendations for the next build run (see D1', right part of the table on slide "Prozess Kontrolle (4)"). Finally, the temperature profile based on a "Jobreport-File" in the context of a wall thickness optimisation (see D1', slide "Prozess Optimierung (1)"), as could be seen in slide "Prozess Optimierung (4)" of document D1'. Thus, the subject-matter of claim 1 differed from document D1' in the shape of the iterative improvement specimens (distinguishing feature (a)) and in the fact that not only the iterative improvement specimens were compared to the set of input data but the at least one production part and the at least one iterative improvement specimen (distinguishing feature (b)).

The problem to be solved by distinguishing feature (b) was to further improve the optimisation of the production parts. Document D21 served as evidence for the common general knowledge of the person skilled in the field of rapid prototyping. On page 207 of document D21, it was stated that rapid prototyping processes

were strongly dependent on their calibration and that the model had to be (at least partly) built several times in order to achieve optimal results. This was also the message of document D3 (see Figure 1.1). In combination with document D1, the teaching of document D21 (or D3) therefore was that the iterative improvement specimen and the production part, which differed from each other in their shape, had to be compared to the set of input data. This led to a high quality production part with a complex and unique geometry in less time with fewer test runs for calibration. It was noted that also Table 1 of the patent in suit dealt with calibration. Therefore, distinguishing feature (b) did not justify the presence of an inventive step.

Regarding distinguishing feature (a) relating to the design of the iterative improvement specimens, the shape of the test specimens was defined in existing standards, such as document D4 for measuring the flexural strength and document D5 for measuring the tensile strength. According to standard document D6 (see point 5.1.3), no specific shape was required for measuring the density. In view of the fact that test specimens were standardised, it was obvious to use a standard shape for the iterative improvement specimens of claim 1. Hence, also distinguishing feature (a) was obvious to the skilled person.

Moreover, documents D3, D8, D9, and D13 could serve as alternative starting points for the assessment of inventive step. Document D3 showed the rapid prototyping cycle on page 5 (see Figure 1.1), which indicated that the production parts were compared with the set of input data (see also D3, page 6, fifth paragraph and chapter 1.5). Claim 1 differed from this

disclosure in that a test specimen was produced in parallel to the production part. However, this was rendered obvious by document D1 which disclosed the parallel production of an iterative improvement specimen and a production part. Hence, the combination of documents D3 and D1 disclosed all features of present claim 1.

Compared with document D8 (see chapters 6.5 and 6.5.3, in particular pages 226, 231 to 233 as well as Figure 6.50), the subject-matter of claim 1 differed in that a production part and an iterative improvement specimen, which were produced in one build run, were compared to the input data set. The problem to be solved by this distinguishing feature (b) was to improve the efficiency and accuracy of the optimisation of the production parts. The skilled person would deduce from the last paragraph of page 233 of document D8 that the process could be improved by measuring test parts and production parts. It was clear to him that not all of the process parameters could be optimised using the test specimen of Figure 6.50 of document D8. Against this background, the solution consisting in comparing not only the iterative improvement specimen but also the production part to the input data was obvious to the person skilled in the art.

According to document D9 (see first paragraph of page 165 and chapter 3.2, in particular Figure 5 on page 166), the production parts and the test specimens of Figure 5 were produced in separate build runs during the optimisation of the process. In view of this prior art, the problem to be solved by the subject-matter of claim 1 was to improve the efficiency of the process optimisation. Starting from document D9, it was obvious to the skilled person that this problem could be solved

by comparing the iterative improvement specimen and the production part, which were simultaneously produced in one build run, to the input data. In this context, it was noted that claim 1 did not provide a definition of the term "production part".

Document D13 (see column 1, lines 1 to 5, column 2, lines 63 to 67, column 6, lines 6 and 52 to 67) essentially disclosed the production of a plurality of production parts in an iterative improvement process. The subject-matter of claim 1 differed from this method in that a production part and an iterative improvement specimen were produced in one build run and were then compared to the input data set. However, in view of the fact that some of the production parts of document D13 had to de destroyed when testing their mechanical properties, it was obvious that simultaneously producing iterative improvement specimens and production parts in one build run and using the iterative improvement specimens for the mechanical testing avoided the destruction of good production parts for testing purposes. This increased the overall efficiency of the iterative improvement process. Hence, for the skilled person, the subject-matter of claim 1 was not inventive over document D13.

Reasons for the Decision

1. Added subject-matter and extension of scope

1.1 Claim 1 of the main request is a combination of original claims 1 and 5, wherein it is further specified that the at least one production part and the at least one iterative improvement specimen are compared to the set of input data to produce the resultant data set. This additional limitation is

originally disclosed as one of the alternatives mentioned in lines 16 to 18 of paragraph [0006] of the application as filed ("*Third, a comparison is made of the output production parts and/or iterative improvement specimens to the set of input data.*"). In view of that, the subject-matter of claim 1 does not extend beyond the content of the patent application as filed.

1.2 As to the respondents' argument that the amendment of claim 1 constituted an intermediate generalisation in view of original paragraph [0006], the board notes that original claim 1 provides a basis for the general definition of the set of input data, information set and the reference to the (at least one) previous build run.

Moreover, the last feature of present claim 1 defines that the at least one production part and the at least one iterative improvement specimen are compared to the set of input data to produce the resultant data set, thereby excluding the alternative of comparing the at least one production part or the at least one iterative improvement specimen to the set of input data. It is not apparent that the information given in lines 9 to 14 of paragraph [0006] of the application as filed ("*The input data includes desired dimensions and desired material characteristics. The information set includes a thermal analysis of a parts bed and fabricated parts, material characteristics of the rapid prototyping material, and/or build parameters, all of which are from previous build runs, known values, and/or computed values.*") is specifically related or inextricably linked to the limitation of the independent claim to the "and"-alternative on the basis of the original disclosure in lines 16 to 18 of the

same paragraph of the original description. In view of that, the addition of the last feature of claim 1 taken from paragraph [0006] of the application as filed does not extend the subject-matter claimed beyond the content of the application as filed.

1.3 Concerning the allegation of a post-grant extension of the scope of protection, the board notes that, compared to the claim as granted, amended claim 1 is restricted to the "and"-alternative, as explained above in paragraph 1.2. The description of the granted patent is unamended. Consequently, the amendment according to the present main request does not extend the protection conferred by the patent (Article 123(3) EPC).

Contrary to the view presented by respondent II, Article 123(3) EPC does not relate to pre-grant amendments of the patent. Hence, any modification of the description during the examination proceedings is immaterial in this respect. In fact, the general intention of this provision is to provide legal certainty for the activities of third parties trusting that the protection conferred by a granted patent can only be restricted, but not extended during subsequent opposition (appeal) proceedings.

1.4 For these reasons, the amended main request meets the requirements of Article 123(2) and (3) EPC.

2. *Sufficiency of disclosure*

2.1 The patent in suit discloses in paragraph [0026] a specific machine type which is preferably used to fabricate parts in accordance with the claimed invention. The essential build and part sintering parameters are outlined in Table 1 in paragraph [0028]

of the patent. Even if this list of variable machine parameters is not exhaustive, it nevertheless offers the skilled person a sufficiently good starting point for putting into practice the method of claim 1.

2.2 Moreover, an objection of lack of sufficiency of disclosure presupposes that there are serious doubts, substantiated by verifiable facts (see Case Law of the Boards of Appeal of the European Patent Office, 9th edition, 2019, II.C.9., for example T 890/02, OJ EPO 2005, 497, Reasons 30). The board observes that, in the present case, the respondents did not submit any evidence, for example experimental results, in order to support their allegation that the information given in the contested patent, in particular in paragraphs [0026] and [0028], is not sufficient for the skilled person to carry out the invention.

Finally, the breadth of a claim does not, as such, prevent the skilled person from putting the invention into practice. Therefore, the respondents' mere assertion that the independent method claim is broad is likewise not sufficient for establishing an insufficiency of disclosure.

2.3 For these reasons, the board concludes that the contested patent discloses the invention in a manner which is sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 100(b) EPC 1973).

3. Inventive step

3.1 The following assessment of the inventive merits of the subject-matter of claim 1 is based on the assumption that documents D1' and D1 were made available to be

public before the priority date of the contested patent, as alleged by respondent I.

3.2 The respondents challenge the presence of an inventive step regarding the subject-matter of claim 1 starting from documents D1', D1, D3, D8, D9 or D13. It is uncontested between the parties that the subject-matter of claim 1 differs from each of these documents at least in the following characterising feature of claim 1:

(b) the at least one production part and the at least one iterative improvement specimen are compared to said set of input data to produce the resultant data set.

3.3 The respondents submit that the technical problem to be solved was to improve the efficiency and accuracy of the optimisation of the production part.

3.4 Turning to the proposed solution, the board notes that none of the prior art documents on file contains a teaching pointing the skilled person to the claimed solution according to distinguishing feature (b).

3.4.1 Documents D1 and D1' show a build run for the production of a combination of at least one production part and at least one iterative improvement specimen (see D1', slide "Prozess Kontrolle (2)"). However, these documents fail to disclose that both, the at least one production part and the at least one iterative improvement specimen, are compared to a set of input data to produce the resultant data set. The penultimate paragraph on page 207 of document D21, which the respondents referred to in this context, explains that rapid prototyping processes are generally strongly dependent on a correct calibration. According

to document D21, optimal results can only be achieved if a model is (at least partly) built several times and if resulting deviations are used for calibrating the machine. However, this passage of document D21 does not hint at the distinguishing feature that the at least one production part and the at least one iterative improvement specimen are compared to a set of input data to produce the resultant data set. The same is true for the general definition of the rapid prototyping cycle according to document D3 (see Figure 1.1 on page 5). Therefore, a combination of document D1' (or D1) with documents D21 or D3 cannot render obvious the claimed solution.

3.4.2 This conclusion also applies to document D8, where the correct build parameters are determined on the basis of a production part by trial and error or by building and measuring a model part (see D8, page 231, last paragraph and top of page 232). Even if it is further stated (see D8, bottom of page 233) that, due to shrinkage, the best scale value for a particular (production) part geometry may be different than the one determined from a model part, there is no suggestion that the at least one production part and the at least one iterative improvement specimen are both compared to a set of input data.

3.4.3 Similarly, the cited passages of documents D3 (see Figure 1.1), D9 (see first paragraph of page 165 and chapter 3.2 as well as Figure 5 on page 166) and D13 (see column 1, lines 1 to 5, column 2, lines 63 to 67, column 6, lines 6 and 52 to 67) fail to disclose a combined build run for the production of at least one production part and at least one iterative improvement specimen, let alone that the at least one production part and the at least one iterative improvement

specimen are both compared to a set of input data. Consequently, these documents are equally not suitable for pointing the skilled person to distinguishing feature (b).

3.5 In view of the content of the documents on file, including documents D1 and D1', the subject-matter of claim 1 of the main request is based on an inventive step according to Article 56 EPC 1973.

Under these circumstances, the disputed issue of whether or not documents D1 and D1' were actually made available to the public before the priority date of the patent, can be left undecided.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent in amended form in the following version:

   - claim 1 to 10 filed with letter dated 6 September 2019 as main request;

   - description, pages 2 to 9 and

   - drawings, figures 1 to 6 of the patent specification.

The Registrar: The Chairman:

N. Schneider M. Poock

Decision electronically authenticated