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**Datasheet for the decision
of 21 January 2025**

Case Number: T 1277/22 - 3.2.01

Application Number: 14183175.0

Publication Number: 2848356

IPC: F01D5/14, F01D5/00, B23P6/00

Language of the proceedings: EN

Title of invention:

A method for repairing a turbine component wherein damaged material is removed and a plug with improved material properties is inserted and a corresponding repaired component

Patent Proprietor:

General Electric Technology GmbH

Opponents:

Siemens Aktiengesellschaft
Raytheon Technologies Corporation

Headword:

Relevant legal provisions:

EPC Art. 84, 52(1), 56, 123(2)

Keyword:

Claims - clarity (yes)

Inventive step - (yes)

Amendments - added subject-matter (no)

Decisions cited:

Catchword:



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Case Number: T 1277/22 - 3.2.01

D E C I S I O N
of Technical Board of Appeal 3.2.01
of 21 January 2025

Appellant: Raytheon Technologies Corporation
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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
10 March 2022 concerning maintenance of the
European Patent No. 2848356 in amended form.**

Composition of the Board:

Chairman G. Pricolo
Members: V. Vinci
 A. Jimenez

Summary of Facts and Submissions

- I. The appeal filed by the appellant (opponent 2) is directed against the interlocutory decision of the opposition division maintaining the European patent No. 2 848 356 in amended form.

In its decision the opposition division held that the ground for opposition pursuant to Article 100(c) EPC was prejudicial to the maintenance of the patent as granted and that the auxiliary request 1 did not comply with the requirements of Article 123(2) EPC for the same reasons. The patent was maintained on the basis of the auxiliary request 2 filed at the oral proceedings. Novelty of the subject-matter of independent claim 1 of the auxiliary request 2 was not contested. The opposition division positively assessed compliance with the requirements of Articles 84 and 123(2) EPC and found that the subject-matter of independent claim 1 was not rendered obvious, among others, by the combination of the following prior-art documents:

D2 : US-A-6 238 187
D10 : US-A-5 972 424

- II. With the communication according to Article 15(1) RPBA dated 21 August 2024 the Board informed the parties of its preliminary assessment of the case.

Oral proceedings pursuant to Article 116 EPC were held before the Board on 21 January 2025 by videoconference.

- III. The appellant (opponent 2) requested that the decision under appeal be set aside and that the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed or, in the alternative, that the patent be maintained according to the auxiliary request 2a filed with the reply to the statement of grounds of appeal of the appellant (opponent 2), or according to one of the auxiliary requests 3 and 4 filed on 25 February 2021.

The opponent 1 (party as of right) did not file any submission in the appeal proceedings.

IV. Independent claim 1 of the patent according to the version allowed by the opposition division reads as follows (labelling of the features according to the decision under appeal):

1.1 *"A method (100) of repairing a turbine component comprising:*

1.2 locating (120) a damaged area (105) in the turbine component (101);

1.3 removing (130) the damaged area (105) by machining to form a machined region (115);

1.4 inserting (140) a plug (125) into the machined region (115), the plug (125) being formed of a material (124) having the same composition a similar composition or a composition with superior material properties to that of a base material (109) of the turbine component (101);

1.5 securing (150) the plug (125) to the turbine component (101);

1.6 machining (160) the material (124) of the plug

(125) to form a smooth contour, flush with a geometry of the turbine component (101); and

1.7 restoring (190) internal cooling holes in the turbine component (105), which were covered or closed off during insertion and securing of the plug (125), by drilling with a shaped-tube electrochemical machining (STEM) device; and

1.8 applying (180) a coating (108) over at least a portion of the turbine component (101)."

Reasons for the Decision

PATENT AS MAINTAINED

Article 84 EPC - Clarity

1. The patent as maintained complies with the requirements of Article 84 EPC as correctly assessed by the opposition division.
- 1.1 The appellant (opponent 2) criticized the view of the opposition division that the expression "*internal cooling holes*" in feature 1.7 of claim 1 was clear in itself and alleged that - on the contrary - it generated doubts regarding what had to be restored. The appellant (opponent 2) pointed out that the definition of the term "*internal*" adopted by the opposition division, i.e. that a hole was internal when it extended within the turbine (see point 4.1.2 of the appealed decision), was ambiguous because it led to a construction of the expression "*internal cooling holes*" of claim 1 covering both purely internal and partially internal cooling holes. The passage of the description on page 7, lines 17-18 (see [0023] of the A-Publication) cited by the opposition division in support of this interpretation - if read to the end - generated further confusion rather than confirming the reading of the department of first instance. With the further submissions dated 30 December 2024, the admissibility of which was contested by the respondent (patent proprietor) under Article 13(2) RPBA, the appellant (opponent 2) presented on page 2 a figure showing exemplary repairs of cooling holes labelled A to C all allegedly covered by the interpretation adopted by the opposition division. It was put forward that, due to the lack of clarity of the term "*internal*

cooling holes", the person skilled in the art could not assess which of these three examples did, or did not fall within the scope of claim 1 of the patent as maintained, thereby engendering a doubt regarding the extension of the scope of the protection afforded. In the appellant's (opponent 2's) view, the cited paragraph [0023] of the A-publication described a functional restoration, namely the restoration of the cooling flow through the cooling holes. This interpretation had to be applied also to feature 1.7 of claim 1. Since a restoration of the cooling flow was achieved in the example C in figure 1 of the submissions of 30 December 2024, the skilled person was in doubt whether the claimed method was meant to encompass also this kind of situation. Furthermore, if the interpretation adopted by the opposition division was correct, also the example B in the same figure was covered by claim 1. However, in this case, an inconsistency and hence a lack of clarity resulted from the fact that the internal cooling hole according to example B could not be restored by drilling with a shaped-tube electrochemical machining (STEM) device, as required by claim 1 because there was no way to access this portion of the plug by the STEM drilling device once the plug was secured to the turbine component. The appellant (opponent 2) concluded that the expression "*internal cooling holes*" caused multiple contradictions and ambiguous interpretations resulting in a lack of clarity under Article 84 EPC and this irrespective of whether the person skilled in the art read it "*per se*" or in the light of the description.

1.2 The Board is not convinced for the following reasons:

As correctly pointed out by the respondent (patent proprietor) and contrary to the reading of the

appellant (opponent 2), feature 1.7 of claim 1 literally requires that the internal cooling holes are restored and not that the cooling flow/cooling functionality is restored. Restoring the internal cooling holes clearly means that they are returned to the original geometry and path that they had before having been modified/affected by the insertion of the plug. The fact that the cooling functionality is indeed concurrently restored is only a consequence of the restoration of the original geometry of the internal cooling hole achieved by the drilling operation. This is fully consistent with the teaching of paragraph [0023], lines 7 to 13 of the patent specification which express this concept. In view of the above and as convincingly argued by the respondent (patent proprietor), a person skilled in the art reading and construing the claim with a mind willing to understand has thus no doubt that the expression "*internal cooling holes*" indicates:

those cooling passages which were provided through the turbine component before repairing, the geometry of which was somehow affected by the insertion of the plug to the extent to partially or completely obstruct the flow of the cooling gas therethrough, and which according to the claimed method are returned to the original geometry by drilling out the obstruction/s created by the plug on their cooling path.

- 1.3 In view of the above, the examples B and C presented by the appellant (opponent 2) with their last submissions are clearly not covered by the claim. The hole of the example B is not an internal cooling hole because it does not have either an inlet nor an outlet which render possible to establish a cooling flow therethrough. The hole of the example C - contrary to

the opinion of the appellant (opponent 2) - does not fall within the above definition either because the portion in dotted line is clearly not the result of a restoration operation, but represents an additional bypass hole drilled through the turbine component to merely restore the cooling functionality. The original geometry of the hole is not restored.

Amendments - Article 123(2) EPC

2. The patent as maintained complies with the requirements of Article 123(2) EPC as correctly assessed by the opposition division.

- 2.1 The appellant (opponent 2) maintained that the introduction from original paragraph [0023] of the A-Publication of the term "*internal*" to qualify the cooling holes as "*internal cooling holes*" infringed Article 123(2) EPC. It was argued that the step of restoring the internal cooling holes was presented in paragraph [0023] of the A-Publication in combination with the information that the holes were restored by drilling through the modification material (emphasis added). However, since this information was omitted in claim 1, an unallowable intermediate generalisation arose. The appellant (opponent 2) put forward that, contrary to the view of the opposition division, this omitted information could not be considered implicit, as shown in example C of the figure of the submissions dated 30 December 2024, where drilling was not carried out through the modification material. They concluded that the amendment caused claim 1 to encompass undisclosed embodiments, for example the above mentioned example C, thereby infringing Article 123(2) EPC.

- 2.2 The arguments of the appellant (opponent 2) are not convincing:

The Board shares the view of the opposition division and the respondent (patent proprietor) that the person skilled in the art implicitly and unambiguously derives the information that drilling takes place through the modification material from the wording of feature 1.7 of claim 1. In fact, as explained under point 1.3 above, a correct reading of feature 1.7 inherently excludes a possibility according to the example C, i.e. a situation where the drilling does not affect the plug/modification material. Therefore, claim 1 does not contain any undisclosed information as correctly concluded by the opposition division.

3. Novelty within the meaning of Articles 52(1) and 54 EPC was never contested.

Articles 52(1) and 56 EPC - Inventive Step

4. The subject-matter of independent claim 1 of the patent as maintained is not rendered obvious by the prior art as correctly concluded by the opposition division.

- 4.1 With their statement of grounds of appeal the appellant (opponent 2) contested the conclusion of the opposition division and put forward that the method according to independent claim 1 did not involve an inventive step in view of document D2 in combination with D10 and reverse.

D2 in combination with D10

- 4.2 There is agreement that document D2 does not explicitly disclose that the individual airfoil or the integral

blade which are subject to the repair method described therein (see column 6, line 25-26) are provided with internal cooling holes. It is thus also uncontested that feature 1.7 of claim 1 cannot be directly and unambiguously derived from this prior art method.

- 4.3 The appellant (opponent 2) argued that even if it could be agreed that not all the turbine components were provided with internal cooling holes, and therefore that this structural feature could not be implicitly read in D2, the person skilled in the art immediately realized that this known method was generally suitable also for repairing fluid cooled airfoils which represented the most common situation. Reference was made in this respect to the statements in column 1, lines 36-43 and in column 10, lines 61-67 of D2. The appellant (opponent 2) further argued that the person skilled in the art would thus obviously try to apply the repairing method of D2 also in the very common situation in which the turbine component to be repaired comprised internal cooling holes located, at least in part, within the repair that could be affected in their cooling functionality when replacing the damaged portion by the repair material/plug. With this idea in mind, the person skilled in the art would obviously consider document D10 that in the background art section indicated that plugged cooling holes possibly resulting from re-coating of the surface of the turbine component must be reworked to restore the cooling functionality. The appellant (opponent 2) further referred to the passage in column 6, lines 37-41 of D10 suggesting that cooling holes that became partially or fully plugged with the coating during a re-coating operation could be reworked by any conventional method like for example electro-discharge machining (EDM) or any other suitable method, this last sentence clearly

pointing to STEM drilling which was commonly used to make long, deep precision holes in hard corrosion-resistant materials. Therefore, the appellant (opponent 2) concluded that, contrary to the assessment of the opposition division, the subject-matter of claim 1 of the patent as maintained is rendered obvious by D2 and D10 in combination.

4.4 The arguments of the appellant (opponent 2) are not convincing for the following reasons:

It is agreed that the person skilled in the art, in view of the fact that a large number of turbine components require cooling and are thus provided to this purpose with a cooling system comprising internal cooling holes, would not rule out the possibility to apply the method of D2 also to fluid cooled airfoils. However, the Board, in agreement with the respondent (patent proprietor), does not see why the person skilled in the art aiming to solve the technical problem to restore the cooling functionality of the cooling passages which may have been eventually affected by the repair and without knowledge of the invention, should be motivated to apply the cited teaching of column 6 of D10 to the method of D2. As convincingly pointed out by the respondent (patent proprietor), D10 teaches to restore by EDS machining the inlet or outlet opening of any cooling hole which may have been closed off by the application of a metallic flash coat to the surface of the airfoil component (see column 6, line 37-41 and claim 3 of D10). This teaching is not extended to cooling holes which were closed off or covered by the insertion of an external plug as it is the case of the contested patent and of document D2. Therefore, the Board shares the view of the respondent (patent proprietor) that the

person skilled in the art is not motivated to extract this teaching from the specific technical context of D10, i.e. restoring the functionality of the inlet and outlet openings of the cooling holes which may have been closed off during re-coating, and to apply it to the different technical context of D2 where the whole geometry and path of the (possibly present) cooling holes would be extensively affected by the insertion of a plug intersecting the effective path of cooling passages located beneath the area of the repair. Therefore, the Board concludes that starting from D2 and even in view of D10, the person skilled in the art is not provided with any obvious hint to introduce the step 1.7 in the method of D2.

D10 in combination with D2

- 4.5 The parties at the oral proceedings referred in respect of this second inventive step attack to the arguments provided in writing and did not make any further submission. The Board has thus no reason to deviate from its preliminary assessment of this issue as set out in the communication according to Article 15(1) RPBA which is herewith confirmed and reads as follow:
- 4.6 The appellant (opponent 2) argued that whilst D10 referred to reworking cooling holes plugged by a coating, it was obvious to apply the same solution to cooling holes that have become plugged as suggested by D2, thereby arriving without inventive step to the subject-matter of claim 1 of the patent as maintained. In this respect it was observed that there is no difference in terms of cooling airflow between a cooling hole plugged by a coating, as it is the case of D10, and a cooling hole plugged by a plug as it is the case of the method of D2, and that the feature that

drilling is carried out through the plug is not recited in claim 1.

4.7 Also these arguments cannot be followed:

As convincingly put forward by the opposition division and the respondent (patent proprietor), reopening/restoring cooling holes which were closed off when re-coating an airfoil surface as disclosed in D10 does not technically correspond to the restoring of cooling holes which were closed off by the insertion of a plug element into a machined region as required by claim 1. In the first situation, only the inlet and/or outlet openings of the cooling holes which are obstructed by the coating need to be restored, while in the second situation at least a portion of the obstructed cooling path has to be restored. Furthermore, contrary to the assumption of the appellant (opponent 2), the combination of D10 with D2 would still fail to disclose the feature that STEM drilling is carried out through the plug, which is considered implicit in the wording of feature 1.7 of claim 1 (see point 2.2 above). The Board also agrees with the opposition division and the respondent (patent proprietor) that the reasoning put forward by the appellant (opponent 2) in support of this attack is based on a not convincing and also unallowable ex post facto analysis which is not suitable for correctly assessing inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



M. Schalow

G. Pricolo

Decision electronically authenticated