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Datasheet for the decision of 29 November 2021

Case Number: T 1316/18 - 3.2.01

Application Number: 08251540.4

Publication Number: 1987903

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Language of the proceedings: EN

Title of invention:
Method for manufacturing a turbine engine component

Patent Proprietor:
Raytheon Technologies Corporation

Opponent:
Safran Aircraft Engines

Headword:

Relevant legal provisions:
EPC Art. 52(1), 56

Keyword:
Inventive step - main request (yes)

Decisions cited:

Catchword:

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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 1316/18 - 3.2.01

D E C I S I O N
of Technical Board of Appeal 3.2.01
of 29 November 2021

Appellant: (Opponent)	Safran Aircraft Engines 2 boulevard du Général Martial Valin 75015 Paris (FR)
Representative:	Brevalex 95, rue d'Amsterdam 75378 Paris Cedex 8 (FR)
Respondent: (Patent Proprietor)	Raytheon Technologies Corporation 10 Farm Springs Road Farmington, CT 06032 (US)
Representative:	Dehns St. Bride's House 10 Salisbury Square London EC4Y 8JD (GB)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 9 March 2018 concerning maintenance of the European Patent No. 1987903 in amended form.**

Composition of the Board:

Chairman	G. Pricolo
Members:	V. Vinci
	O. Loizou

Summary of Facts and Submissions

I. The appeal filed by the appellant (opponent) is directed against the interlocutory decision of the opposition division to maintain the European patent No. 1 987 903 in amended form.

In its decision the opposition division held that the ground for opposition under Article 100(a) in conjunction with Article 54 EPC prejudiced the maintenance of the patent as granted, and decided that the patent could be maintained in amended form according to the auxiliary request 1. In particularly, the opposition division came to the conclusion that the subject-matter of independent claim 1 according to the auxiliary request 1 was novel in the meaning of Article 54 EPC and involved an inventive step in the meaning of Article 56 EPC in view of the following prior art:

D4: EP 1 391 537 A
V2: US 2005/0166397 A
W1 : paragraph [0002] of the contested patent
W2: EP 0 340 149 A
W3: EP 1 251 243 A
W5: col. 1, lines 14-20 of document W4:US 4 294 396 A
W8: *"Technique de l'ingenieur BM7778 Assemblage metallurgique dans la construction de turboreacteur"*
W9: *"Processes and Design for manufacturing"*, Sherif D. El Wakil, Second Edition 2002.

With the communication according to Article 15(1) RPBA dated 24 February 2020 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 29 November 2021 by videoconference.

II. The appellant (opponent) requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

The respondent (patent proprietor) requested that the appeal be dismissed (main request) or, in the alternative, that the patent be maintained in amended form on the basis of auxiliary request 1 or auxiliary request 2, all requests filed with the reply to the statement of the grounds of appeal.

III. Claim 1 of the patent in amended form as maintained by the opposition division reads as follows (labelling of the features as proposed by the appellant):

"A method for manufacturing a turbine engine component, the method comprising:

(a) *providing a layered structure (16) having base structure (18;28) having a major surface (22; 32) and a brazing layer (20; 30a) secured to the major surface (22; 32),*

(b) *said base structure (18;28) being a metallic plate;*

(c) *positioning the layered structure (16) onto a turbine engine component surface (12) such that at least a portion of the brazing layer (20; 30a) contacts the turbine engine component surface (12);*

(d) *heating the turbine engine component (10) containing the layered structure (16); and cooling the turbine engine component (10), thereby fusing the*

layered structure (16) to the turbine engine component with the brazing layer (20; 30a); further comprising:

(e) *coating a brazing material onto the major surface (22; 32) of the base structure (18; 28); and*

(f) fusing the brazing material to the base structure (18; 28)."

Reasons for the Decision

INVENTIVE STEP: ARTICLES 52(1) and 56 EPC

1. The subject-matter of claim 1 of the patent as maintained involves an inventive step over the prior art in the meaning of Articles 52(1) and 56 EPC as correctly assessed by the opposition division in the decision under appeal.

2. The appellant (opponent) contested the assessment of the inventive step of the opposition division with the following arguments:

2.1 It was initially pointed out that the steps according to features (e) and (f) added in claim 1 according to auxiliary request 1 in order to restore novelty with respect to document V2 merely related to the manufacture of a layered brazing structure *"per se"* and, as such, did not contribute to the solution to the main problem addressed by the contested patent as described at the bottom of paragraph [0008], namely to improve the prior art turbine engine manufacturing method in such a way to reduce the time required to perform the brazing operation, and to allow the brazing operation to be performed in an automated manner

without requiring expensive monitoring systems. Furthermore, the appellant (opponent) drew the attention of the Board to the term *"fusing"* in feature (f) and alleged that it should be interpreted broadly as simply meaning *"securing"* or *"connecting"* in view of the definition provided by the contested patent itself for example in paragraphs [0011] and [0013].

2.2 The Board does not share said observations of the appellant (opponent):

The Board concurs with the view of the respondent (patent proprietor) that the manufacture of the layer structure (16) defined in feature (a) and (b) carried out according to steps (e) and (f) represents the key technical teaching underlying the contested patent. As convincingly explained by the respondent (patent proprietor), a layered structure manufactured according to the steps (e) and (f) can be easily tailored for any specific constructional need, for example by varying the thickness and/or the extension of the brazing material across the the major surface of the base structure. Such a tailored and pre-manufactured base structure/cover sheet can thus be directly positioned on the corresponding area of the element to be covered, thereby permitting its use in an automated process and consequently a reduction of the time required for carrying out the brazing method.

Regarding the term *"fusing"*, the Board concurs with the respondent (patent proprietor) that the method according to claim 1 requires a first step of *"coating"* a brazing material onto the major surface of the base structure (see feature (e)) followed by a second and distinct step of *"fusing"* the brazing material to the base structure. While according to the description the

term *"coating"* covers indeed several possible coating techniques (see paragraph [0011], lines 42-44), the term *"fusing"* will be interpreted by the person skilled in the art as a connecting process at high temperature causing interdiffusion of at least a portion of the brazing material with the material of base structure. Therefore, contrary to the view of the appellant (opponent), the term *"fusing"* in the meaning of the contested patent (see also paragraph [0013]) does not encompass any kind of securing technique.

2.3 Also based on the considerations presented in paragraph 2.1 above, the appellant (opponent) presented the following lines of inventive step attack:

W1, W2 or W3 in view of W4 or W5 (common general knowledge)

2.4 The appellant argued that the known brazing method disclosed in paragraph [0002] of the contested patent (thereafter labelled as W1), as indeed W2 and W3, represented a suitable closest prior art reflecting a brazing method comprising the steps (a) to (d) of claim 1 at stake. This assumption was not contested by the respondent (patent proprietor). The appellant (opponent) recognized that the additional steps according to features (e) and (f) of claim 1 were not derivable from either of documents W1, W2 or W3, but alleged that they merely defined a possible way to obtain the layered structure according to claim 1, said possible way being obvious in view of common general knowledge documented by the passage W5 of document W4 (see column 1, lines 14-20). This allegation was substantiated by arguing that the passage W5 of document W4 clearly indicated that it belonged to common general knowledge *"In order to increase*

productivity " to provide *"a coating layer of filler metal in advance on a joint surface of a base metal to be brazed".* The appellant (opponent) alleged that this teaching essentially corresponded to a base structure manufacturing method according to feature (e) and (f) of claim 1. The appellant (opponent) did not contest that the step of *"fusing the brazing material"* of features (f) could not be explicitly read in the expression *"to provide a coating layer of filler metal"* of passage W5, and that this passage did not specify whether the layer of filler material was provided on the base structure, as required by feature (e) or instead on the turbine component. However, it was alleged that securing the brazing material by "*fusing*", in particular to the base structure, should be considered an obvious selection among the many securing techniques available and the only two possible alternative locations of the connection which were covered by the wording of passage W5 . Therefore, the appellant (opponent) concluded that, in view of common general knowledge as documented by the passage W5, the person skilled in the art aiming to increase the productivity of the know brazing method, would obviously implement the known brazing methods of W1, W2 or W3 according to the feature (e) and (e), thereby arriving without inventive step to the subject-matter of claim 1. The fact that in the same passage this known technique is presented as being *"disadvantageous in that a great deal of money is required for equipment and manufacturing"* was considered irrelevant because the same drawback affected the method according to the contested patent. The appellant (opponent) came to the same conclusion regarding the alleged lack of inventive step also in view of the method disclosed in W4 and in particular of the manufacture of the layered structure

shown in figure 3 and disclosed therein.

2.5 The Board is not convinced by the reasoning of the appellant (opponent):

Both the opposition division and the respondent (patent proprietor) convincingly argued that the teaching W5 is very general and in particular not relating to the particular technical context of the attacked patent, namely the manufacture and/or the repair of turbine engine components. The wording "to *provide a coating layer of filler metal in advance on a joint surface of a base metal to be brazed*" does not directly and unambiguously imply any kind of connection which could be equated with a *"fusing"*, the latter being understood by a person skilled in the art as a connection obtained at high temperature and implying interdiffusion of the brazing material into the material of the base structure (see point 2.2 above). In fact the expression *"to provide"* is extremely broad and does not exclude, for example, the possibility to simply place the filler material on one of the joint surfaces or to secure it thereto by an adhesive.
Therefore, the Board concurs with the opposition division and the respondent (patent proprietor) that it is not possible to directly and unambiguously derive the distinguishing features (e) and (f) from the passage W5, whereby W1, W2 or W3, even in combination with the alleged common general knowledge of the passage W5, cannot lead without inventive step to the subject-matter of claim 1. The same applies when considering W1, W2 or W3 in combination with the actual teaching of document W4 which is completely silent regarding the possibility to obtain a layered structure to be used in a brazing method suitable for turbine engine components according to the steps (e) and (f) of

claim 1.

V2 in view of common general knowledge

2.6 The appellant put forward that document V2 represented an equally promising starting point because it related to a method of repairing a turbine engine component according to features (a) to (d) of claim 1. It was further argued that paragraph [0033] disclosed a method for manufacturing a cover plate/layered structure comprising the steps (e) and (f) wherein however, contrary to step (e) of claim 1, it was the top layer (24) forming the base structure and sprinkled onto the major surface of the bottom layer (26) which corresponded to the brazing material and not vice versa, whereby reversing the layer subjected to coating did not imply an inventive step. The appellant rebutted the finding of the opposition division and the respondent (patent proprietor) that the layers (24) and (26), irrespectively of their functionality as base structure or brazing material, were provided, before the sintering operation disclosed in paragraph [0033], as powdered layers which thus could not be equated to a metallic plate as required for the base structure of claim 1, by drawing the attention to paragraph [0030] of document V2 teaching that *"pre-sintered materials are preferred".* From this passage the appellant (opponent) inferred that the layers (24) and (26) could be provided in the form of pre-sintered materials which would equate the mechanical characteristics of a metallic plate, and this also before the following sintering operation described in paragraph [0033]. Furthermore, the appellant (opponent) argued that the fact that the thickness of the bottom layer (26) after sintering (see paragraph [0034]) is of the same order of magnitude as its thickness before sintering (see

paragraph [0033]) would confirm that the bottom layer (26) is comparable with a metallic plate. Finally, the appellant put forward that the obvious step of covering an area of a turbine engine component which has been previously repaired by brazing a cover plate thereon with a second cover plate obtained as described in paragraph [0033] of document V2 would lead to the subject-matter of claim 1.

2.7 The Board is not convinced by the reasoning of the appellant (opponent):

The process of obtaining the layered compound described in paragraph [0033] of document V2 foresees that the materials of the bottom layer (26) and of the top layer (24) are superimposed while being still in the form of a blended powder. The subsequent pressing operation in a die which precedes the sintering step does not change the fact that the two pressed layers of the compound are still in a powdered state, i.e. they cannot be equated to a metallic plate yet. It follows that the opposition division was correct in concluding that it cannot be derived from document V2 that a metallic plate is coated with a brazing material as required by feature (e) of claim 1, because when the powder of the top layer (24) is sprinkled over the powder of the bottom layer (26), either layers are not in plate form yet. In this respect the considerations of the appellant (opponent) regarding the thickness of the layer (26) before and after sintering are void because the fact that an element, in this case a layer of a powder material, has a thickness compatible with the commonly accepted dimensioning of a plate, i.e. thickness comparatively small with respect to the other dimensions, does not mean that this element has the mechanical characteristics of a metallic plate.

Furthermore, the Board concurs with the respondent (patent proprietor) that the teaching of paragraph [0030] is very general and gives no clear and unambiguous hint to the use of a pre-sintered bottom layer (26) on which the powdered material of the top layer (24) is sprinkled according to the process disclosed in paragraph [0033]. Furthermore, the Board is convinced that the term *"pre-sintered material"* is very broad and cannot directly and unambiguously identify an element with the mechanical characteristics of a metallic plate. Finally, in the Board's view, the allegation of the appellant (opponent) that a second repair of a turbine blade component carried out by superimposing a second cover plate obtained by the manufacturing process of paragraph [0033] onto a similar first cover plate previously brazed onto to the turbine engine component is merely hypothetical and speculative and it is not supported by any passage of document V2.

D4 and common general knowledge

2.8 The appellant put forward that document D4 can also be considered to be a suitable closest prior art document for the same reasons presented in respect of document V2. It was essentially argued that in view of the statements in paragraphs [0043] to [0045] and [0077] as well of claim 14 the element (9) in figure 2b which is superimposed to a layer of brazing material (3), due to the prevalent presence of metallic elements, should be considered as a metallic plate in the meaning of claim 1. It was thus concluded that the only difference with respect to the method of claim 1 was again that, contrary to the step (e), it was the metallic base structure which was coated onto the major surface of the brazing layer and not the contrary as required by

claim 1, whereby the subject-matter of claim 1 did not involve an inventive step with respect to D4 for the same reasons presented in respect of document V2.

2.9 The Board is not convinced by the reasoning of the appellant (opponent):

As convincingly assessed by the the respondent and the opposition division, there is no disclosure of a metallic plate in D4. In particular the coating abrasive layer (9), as correctly assessed by the opposition division is definitely not a metallic plate. According to paragraph [0045] of D4 in combination with figure 2b, the coating material layer (9) is formed by coating a mixture of coating material particles (13) and (15) and a binder (11). The indication in paragraph [0045] that this mixture is *"poured"* onto the bottom layer of brazing material (3) contradicts the view of the appellant (opponent) that the layer (9) at this stage of the manufacturing process as represented in figure 2b and corresponding to coating step (e) of claim 1, is in the form of a metallic plate. As correctly assessed by the opposition division and put forward by the respondent (patent proprietor) the same conclusions apply to the embodiment cited by the appellant (opponent) according to which the abrasive layer (9) is composed by a mixture of Al_2O_3 as abrasive element and metallic particles MCrAlY in a ratio 30:70 to 70:30. Contrary to the view of the appellant (opponent), Al_2O_3 is a ceramic whose Al atoms are not part of the metallic matrix (19) of the abrasive layer (9). Furthermore the coating material particles are dispersed in a volatile binder (11) which deprives the layer (9) in figure 2b of any metallic plate character. Therefore, as the line of inventive step attack of the appellant (opponent) is

based on the erroneous assumption that the layer (9) is in the form of a metallic plate, the arguments proposed cannot question the inventiveness of the subject-matter of claim 1.

W1, W2 or W3 in combination with W8, W9, V2 or D4

2.10 The appellant (opponent) argued that the idea underlying the contested patent, consisted in providing a layered structure according to features (e) and (f), is generally known in the state of the art, in particular from documents V2, D4, W8 or W9. Therefore it would be obvious to implement the method known from either of documents W1, W2 and W3 in view of the teaching of V2, D4, W8 and W9 and arrive without inventive step to the subject-matter of claim 1.

2.11 Also these lines of attack are not convincing for the following reasons:

As explained in paragraphs 2.6 and 2.9 documents V2 and D4 are completely silent regarding the idea of obtaining a brazing layered structure by coating a base structure provided in the form of a metallic plate with a brazing material which is thereafter fused thereto, according to features (e) and (f). This idea is also not derivable from documents W8 and W9 either:

2.12 W8 merely discloses (see page 19 in combination with figure 37 cited by the appellant (opponent)) that it is possible to obtain a layered auto-brazing element suitable to be directly applied and brazed onto the surface to be component to be repaired. However no details are given as to how this layered auto-brazing element is obtained.

The passage on page 127 of W9 entitled *"Salt-bath brazing"* of W9 cited by the appellant (opponent) in support of this line of attack does not give any hint to a layered structure obtained according to features (e) and (f) of claim 1. It is disclosed therein that *"The filler material is placed in the joint area before brazing and it also sometime cladded"*, but this is not a disclosure of coating a brazing material onto a major surface of a base structure and then fusing it.

2.13 Therefore documents W1, W2 or W3, even when read in combination with the teaching of anyone of D4, V2, W8 and W8 cannot lead without inventive step to the subject-matter of claim 1.

3. As no further inventive attacks were submitted by the appellant (opponent) the Board does not see any reason to deviate from the conclusion of the opposition division that the subject-matter of claim 1 of the patent as maintained involves an inventive step in the meaning of Articles 52(1) and 56 EPC.

Order

For these reasons it is decided that:

1. The appeal is dismissed

The Registrar: The Chairman:

A. Voyé G. Pricolo

Decision electronically authenticated