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Datasheet for the decision of 21 June 2023

Case Number: T 0033/22 - 3.2.04

Application Number: 15175319.1

Publication Number: 2963267

IPC: F02C7/22, F23R3/28

Language of the proceedings: EN

Title of invention:
INSULATED FLOWPATH ASSEMBLY

Patent Proprietor:
Raytheon Technologies Corporation

Opponent:
Safran Aircraft Engines

Headword:

Relevant legal provisions:
EPC Art. 123(2), 54(2), 56

Keyword:
Amendments - allowable (yes)
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
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Case Number: T 0033/22 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 21 June 2023

Appellant: (Opponent)	Safran Aircraft Engines 2 boulevard du Général Martial Valin 75015 Paris (FR)
Representative:	Cabinet Beau de Loménie 158, rue de l'Université 75340 Paris Cedex 07 (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 28 October 2021 concerning maintenance of the European Patent No. 2963267 in amended form.**

Composition of the Board:

Chairman	A. de Vries
Members:	G. Martin Gonzalez
	K. Kerber-Zubrzycka

Summary of Facts and Submissions

I. The appeal was filed by the appellant (opponent) against the decision of the opposition division to maintain the patent in amended form.

The opposition division held inter alia that the maintained claims did not contain added subject-matter, were new and involved an inventive step.

II. In preparation for oral proceedings the board issued a communication setting out its provisional opinion on the relevant issues.

Oral proceedings before the Board were held by videoconference on 21 June 2023.

III. The appellant opponent requests that the decision under appeal be set aside and the patent revoked.

The respondent proprietor requests dismissal of the appeal and maintenance of the patent as upheld by the opposition division (main request), or according to auxiliary requests 1-4 filed with their reply to the appeal on 22 July 2022.

IV. The independent claims of the main request (as maintained by the opposition division) read as follows:

1. "A flowpath assembly (20; 20’; 20’’; 20’’’) comprising:
a first conduit (56; 56’; 56’’; 56’’’) for flowing a fluid;
a second conduit (58; 58’; 58’’; 58’’’) surrounding and spaced radially 5 outward from the first conduit (56…

56’’’) with an insulating void (60; 60’) defined between the first and second conduits;
a loosely packed material in the void (60; 60’), wherein the flowpath assembly (20…20’’’) is additive manufactured as one unitary piece, and the material has insulating properties and is deposited during additive manufacturing of the first and second conduits; and
a support structure (88; 88’; 88’’) in the void (60; 60’), including a plurality of pylons (92, 94) each engaged to and extending between the first and second conduits (56’’; 58’’), wherein the insulating material and the support structure (88; 88’; 88’’) have the same material composition, and the void (60) is sealed and at a negative atmospheric pressure."

6. "A method of manufacturing the flowpath assembly (20…20’’’) of claim 1, the method comprising the steps of:
electronically modeling the flowpath assembly (20…20’’’) having the first conduit (56…56’’’) co-extending and surrounded by the second conduit (58…58’’’);
additive manufacturing the first conduit (56…56’’’);
additive manufacturing the second conduit (58…58’’’) generally simultaneously to manufacturing of the first conduit 5 (56…56’’’);
depositing the insulating material generally during manufacturing of the first and second conduits, wherein the additive manufacturing of the first and second conduits and the depositing of the insulating material all include depositing of a powder; and
additive manufacturing a support structure (88; 88’; 88’’) engaged between the first and second conduits and generally during the manufacturing of the first and second conduits,
wherein the flowpath assembly (20…20’’’) is modeled into a plurality of slices (118) each slice having a

portion of the first conduit (56…56’’’), the second conduit (58…58’’’) and the insulating material, and a first slice of the plurality of slices (118) is manufactured in-part through melting and solidification before proceeding to the manufacture of a next successive slice of the plurality of slices (118), and the insulating material is not melted."

V. In the present decision, reference is made to the following documents:

(O1) GB 2 416 319 A
(O2) US 2011/0247590 A1
(O3) WO 2009/039142 A2
(O8) A. Bahadori, « Thermal Insulation Handbook for the Oil, Gas, and Petrochemical Industries », eBook ISBN: 9780128007853, Gulf Professional Publishing, published 14 March 2014, pp. 312-315.
(O8’) Screenshot of the O8 editor's website, https://www.elsevier.com/books/thermal-insulation-handbook-for-theoil-gas-and-petrochemical-industries/bahadori/978-0-12-800010-6, showing the document's publication date.
(O9) CA 861470
(O10) R. Caps, Th. Rettelbach, M. Ehrmanntraut, S. Korder, J. Fricke, “Development of Vacuum Super Insulations With Glass Cover And Powder Filling”, Insulation Materials, Testing and Applications, 3rd Volume, American Society for Testing and Materials, 1997.
(O11) GB 788,358
(O12) US 4,505,977

VI. The appellant's arguments can be summarised as follows:

Independent claim 6 of the main request contains added subject-matter. The subject-matter of both independent claims is not new and does not involve an inventive step.

VII. The respondent's arguments can be summarised as follows:

The claims as maintained by the opposition division (main request) do not contain added subject-matter, are new and involve an inventive step over the cited prior art. New evidence O8-O12 is not admissible.

Reasons for the Decision

1. The appeal is admissible.

2. Background

The invention is directed to an insulated flowpath assembly, such as those containing conduits within conduits, and its manufacturing method, see specification paragraphs [0001]-[0002]. The flow path assembly has a first conduit for flow of a liquid and a second conduit surrounding it and spaced radially outwardly to form an insulating void, see paragraph [0008]. The assembly includes a support structure and an insulating loosely packed material in the void, both having the same material composition. The void is sealed at a negative atmospheric pressure to further enhance thermal insulation, see paragraphs [0008]-[0013], [0031]. The flowpath assembly is additive manufactured (often referred to as 3D printing), as one

unitary piece, see paragraph [0008] and paragraphs [0040]-[0041] and figure 6 for the additive manufacturing process. Conduits with bends, that are otherwise not insertable if the conduits were separate pieces, together with the support structure can be advantageously manufactured in a single process, see paragraph [0033]. The loosely packed material can be deposited during the additive manufacturing as part of the raw powder layer (and not melted) for having the same material composition as the support structure being manufactured, see paragraph [0044].

3. Main request - Amendments

3.1 The appellant contests the opposition division's findings in section 1.3.1.1 of their decision that the independent method claim (corresponding to upheld claim 6) does not add subject-matter.

3.2 The independent method claim is based on originally filed independent claim 12 in combination with claims 13 to 15. Vis-à-vis original method claims that were directed to a method of manufacturing a flowpath assembly, upheld claim 6 is directed to a method of manufacturing the flow path assembly of claim 1. It thus includes a specific reference to device claim 1 that was not originally present.

In the Board's view, this reference is implicit in original claims 12-15 from a contextual reading of the original claims as a whole. Thus, it is immediately clear to the skilled person that the original manufacturing method claims 12-15, even without explicit reference, were meant to define and claim the manufacturing processes that result in the flowpaths of the original preceding claims. Indeed, there was never

any suggestion in the original disclosure that the methods described and claimed would result in flowpaths that are different from those described and claimed. It may be, as argued by the appellant, that sometimes in an application method and apparatus claims may not be unitary, because the product resulting from a claimed method and the expressly claimed product are different. However, that is not the case here, where there was always a clear correspondence between claimed flowpath features and claimed method steps that produce them. In particular original claims 12 to 15 specify the steps of additive manufacture that produce first and second surrounding conduit with support structure and loosely packed material in the void between them of original claims 6 to 8 that are the basis of present claim 1.

3.3 Nor has the appellant convincingly demonstrated that the reference to claim 1 in the method claim implies steps of a method or features of the resultant product (the flowpath) that were not originally disclosed in combination, or which were disclosed in a more specific functional and structural context. For example, method claim 6 refers to *powder* (original claim 13) instead of the broader *loosely packed material* of claim 1 , but in the original disclosure powder appears in all embodiments together with the other features in claim 1 anyway and is never linked to a specific realization of the flowpath. The same applies to the implicit step that the void is sealed at a negative atmospheric pressure added by the reference to claim 1. It is immediately clear to the skilled person using normal reading skills and with their mind willing to understand from the way this feature is mentioned in original paragraph 0030 ("the void may be ....") that it is disclosed as a general additional measure to further enhance thermal insulation that applies

independently across all embodiments and manufacturing methods disclosed. Its inclusion in the upheld method claim does not therefore represent added subject-matter.

3.4 The appellant further contested during the oral proceedings that there would be no support for a method with the added limitation by the reference to claim 1, that the support structure and the insulating material are made of the same material composition. However, this feature was already present as an optional feature in original method claim 14.

3.5 The Board is satisfied that claim 6 of the main request satisfies the requirements of Article 123(2) EPC.

4. Main request - Novelty.

4.1 In the Board's opinion, upheld claims 1 and 6 are new over O1 and O2, as also held by the opposition division, cf. section 5.6 of the impugned decision.

Neither document discloses the claimed feature of a loosely packed material within the sealed void that has the same material composition as the support structure. Nor do they disclose that such a filled void is at a negative pressure.

4.2 02 discloses a flow path assembly with internal and external conduits 108, 114 defining a void between them, see abstract and figure 2. The assembly has an internal support structure including a plurality of pylons, cf. lattice support structure 112 described in paragraph 0032. All elements can be integrally manufactured by an additive fabrication process, cf. paragraph 0038.

4.3 The appellant contends that O2, at paragraph 0039, also discloses a loosely packed material with the same material composition as the support structure, within the sealed void. The Board is not convinced.

Paragraph 0039 of 02 reads:

> "It can be noted that some additive fabrication processes, such as sintering, use powder which if not sintered remains in the power [*sic*] form. In order to avoid trapping non sintered power [*sic*] in the lattice structure, small holes can be left in the part, e.g., in the external heat shield, through which the powder can be evacuated. The holes can then be plugged once the powder is removed."

The appellant, as did the division in its decision (section 3.4), infer from the wording "...small holes *can* be left..." (emphasis by the Board) that evacuation of remaining precursor powder is optional. The Board however reads this passage differently. The suggestion to leave small holes is preceded by the stated purpose, which is - "[i]n order to *avoid* trapping non-sintered pow[d]er in the lattice structure. " (emphasis added). In the Board's view the position of the stated purpose at the beginning of the sentence and its unconditional formulation (no "ifs") conveys to the reader a clear teaching to *avoid* trapping non-sintered powder, and thus a clear idea that trapping powder is not desirable. To this end the text then offers a possible solution , namely that small holes *can* be left, leaving open that other possible solutions may be envisaged. Otherwise, 02 nowhere describes finished embodiments with manufacturing powder in the void. That figure 2 would show the option without holes and thus filled

with powder because no such small holes are visible is unconvincing, as figure 2 (or figure 3) also does not show any powder in the lattice structure. The Board cannot thus unambiguously derive from O2 any disclosure of a finished embodiment with trapped precursor manufacturing powder.

4.4 The appellant alternatively argues that paragraph 0040 of O2 discloses the contested feature. However, paragraph 0040 merely states that the void can optionally be filled in with an otherwise undefined matrix material. The only example given is high-temperature resin, a homogeneous, non-particulate material which can neither be described as "loosely packed" nor is the same as the material of the lattice structure. The term "loosely packed material" means that the material is packed "not tightly, slackly; without tightness, closeness , rigidity or cohesion" (OED entry 1 for "loosely"), which in a normal reading implies the material is made of discrete elements, e.g. unbounded particles or fibers, between which there is no cohesion.

4.5 The novelty objection based on document O1 fails for similar reasons. According to O1, page 8 lines 1-5, the interstitial volume between the two conduits may be filled with liquid or foam that solidifies to form a cellular structure. As put forward above for the matrix structure of O2, paragraph 0040, a cellular structure is not a loosely packed material as required by the claim. There is also no suggestion in O1 that the solidifying liquid or foam is of the same material as that of the lattice structure described in page 6, lines 24-31. The Board is wholly unconvinced by the appellant's alternative ad hoc argument that the cellular structure could be considered to be not only

the loosely packed material but also the support structure itself. In a reasonable reading of the claim wording the support structure and the loosely packed insulating material have to be different things, leaving aside that a cellular structure cannot reasonably said to form pylons.

4.6 Claims 1 and 6 are therefore new.

5. Main request - Inventive step

5.1 The appellant argues lack of inventive step starting from O2 in combination with common general knowledge, O1 or O3, alternatively or in addition in combination with the new documents O8-O12.

5.2 As explained above for novelty, O2 does not disclose leaving the manufacturing powder of the same material composition as the support structure permanently in a sealed void between the conduits, at a negative atmospheric pressure.

5.3 Contrary to the appellant's arguments, using a loosely packed material of the same material composition as the support structure has a technical effect. In an additive manufacturing method or device, as is claimed, the same loose precursor material that is added for manufacturing the pylons of the support structure can be left during the manufacturing process to provide thermal insulation. This simplifies the manufacturing process vis-a-vis one in which say a different insulating powder would need to be added in a separate step. The corresponding technical problem can be formulated as: how to provide thermal insulation in a flowpath as in O2 in a simplified manner.

5.4 None of the cited documents teaches or suggests thermal insulation using loosely packed material of the same composition as the support structure in the sealed void.

O1, p8 in 1-5, teaches liquid or foam that solidifies to form a cellular structure.

O3, p. 10 ln 1-10, cites insulating powders without further detail as to its material composition.

Without prejudice to the question of their admissibility, late filed documents O8 to O12 are clearly not prejudicial to inventive step. These document were cited only because they teach that vacuum increases insulating properties for cases of already existing powder or loose insulating material in a void or interstice. There is no mention of a support structure, let alone that these powders or this loose insulating material are of the same material composition as a support structure.

Thus, even if any of these teachings were applied to O2, the resultant flowpath structure would not feature loosely packed insulating material that is of the same material composition as the support structure.

5.5 In the Board's view, the realisation that in the additive manufacture of a flowpath the same material composition can be used for two different functions, namely for insulating and for supporting to simplify the manufacturing process, is not trivial and goes beyond the routine skills of the skilled person. The Board can thus but confirm the conclusions of the opposition division that the independent upheld claims involve an inventive step in the sense of Article 56 EPC.

6. As the appellant's arguments against the findings in the opposition division's decision fail to convince, the Board upholds the opposition division's decision.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

G. Magouliotis A. de Vries

Decision electronically authenticated