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Datasheet for the decision of 20 December 2011

Case Number: T 1744/09 - 3.2.04

Application Number: 99124967.3

Publication Number: 1022456

IPC: F02K 9/64, F02K 9/97

Language of the proceedings: EN

Title of invention:
Coating for a liquid-propellant rocket combustion chamber

Patentee:
Otkrytoe Aktsionernoe Obschestvo "
Nauchno-Proizvodstvennoe Obiedinenie" "Energomash"
Imeni Akademia V.P.Glushko"

Opponent:
Astrium GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 100(a), 56, 133, 134(1)
EPC R. 50(3), 103(1)a, 140, 152

Relevant legal provisions (EPC 1973):
EPC Art. 134
EPC R. 101(4)

Keyword:
"Admissibility of the opposition (yes)"
"Admissibility of the appeal (yes)"
"Inventive step (no)"
"Reimbursement of appeal fee (no)"

Decisions cited:
T 0850/96, T 0425/05

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1744/09 **-** 3.2.04

D E C I S I O N
of the Technical Board of Appeal 3.2.04
of 20 December 2011

Appellant: (Opponent)
Astrium GmbH
Robert-Koch-Str. 1
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Representative:
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Respondent: (Patent Proprietor)
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 26 June 2009 rejecting the opposition filed against European patent No. 1022456 pursuant to Article 101(2) EPC.

Composition of the Board:

Chairman: M. Ceyte
Members: A. de Vries
T. Bokor

Summary of Facts and Submissions

I. The Appellant (Opponent) lodged an appeal, received 26 August 2009, against a decision of the Opposition Division posted 26 June 2009 to reject the opposition against European patent No. 1 022 456 and simultaneously paid the appeal fee. The statement of the grounds of appeal was received 26 October 2009.

II. The opposition had been filed against the patent as a whole based among others on Article 100(a) in combination with Articles 56 EPC for lack of inventive step.

III. The notice of opposition contained in the letterhead the data identifying the patent and the proprietor. The letterhead further contained the following identifications:

Einsprechender: EADS Space Transportation GmbH (with address)
Korrespondenzadresse: EADS Deutschland GmbH (with adress)

Immediately following the letterhead, the notice of opposition started with the following sentence:
"Im Namen der EADS SPACE Transportation GmbH, ein mit der EADS Deutschland GmbH konzernverbundenes Unternehmen, legen wir hiermit Einspruch ...ein, ..."
Following the detailed reasons of the opposition, the notice of opposition on the last page was signed in the following form:
"EADS Deutschland GmbH
(handwritten signature)

A. Hummel
für EADS Space Transportation GmbH
AV-Nr. 48310"

IV. The Patent Proprietor argued during the opposition proceedings that the opposition was inadmissible, because the representative of the opponent appeared to be the EADS Deutschland GmbH, a legal entity not being entitled to represent the opponent. It also argued for a rejection of the opposition on the merits.

V. The Opposition Division held that the opposition was admissible, and that the grounds mentioned did not prejudice the maintenance of the granted patent having regard in particular to the following documents:

E1: P.Rallu e.a.: "RECORD Project Status", Russia-Europe Cooperation on Rocket engine Demonstration, 5th International Symposium, Paris, 1996

E2: S.Beyer e.a.:"Entwicklung thermischer Schutz-schichten für Hochleistungsraketenbrennkammern", DGLR-JT 98-178, Deutsche Luft- und Raumfahrtkongress 1998, DGLR Jahrestagung 1998, Bremen, 5-8 October 1998.

The decision was reasoned both on the admissibility issue and on the substantive grounds of the opposition. In the minutes of the oral proceedings the following order is recorded: "...After deliberation of the opposition division, the chairman announced the following decision: "The opposition is rejected."..."

By contrast, the order of the written decision reads: "The Opposition Division - at the oral proceedings dated 06.05.2009 - has decided:
The opposition(s) filed against the European Patent No. EP-B-1022456 is/are rejected.
The opposition of the opponent(s) EADS Space Transport GmbH is rejected as inadmissible."

VI. A notice of appeal was filed in the name of EADS Space Transportation GmbH on 26 August 2009, again signed by Mr Hummel (but not containing EADS Deutschland GmbH in the signature). The grounds of appeal was filed on 26 October 2009. The grounds contained a letterhead and a signature similar to that of the notice of opposition, with the difference that a further general authorisation number ("AV-Nr. 48428") was also indicated under the handwritten signature.

VII. With letter dated 26 October 2010 the representative of the appellant informed the European Patent Office that the Astrium GmbH succeeded the EADS Space Transportation GmbH. Extracts from the company register were filed to prove that the EADS Space Transportation GmbH was dissolved following its merger (Verschmelzung) with the EADS Astrium GmbH with effect from 20 June 2006, the latter having changed its name thereafter into Astrium GmbH.

VIII. The Appellant requests that the decision under appeal be set aside and the patent be revoked in its entirety. He also requests reimbursement of the appeal fee.

The Respondent (Proprietor) requests rejection of the appeal and the opposition as inadmissible, or in the alternative, the dismissal of the appeal.

Both parties have requested oral proceedings.

IX. The wording of claim 1 as granted is as follows:

"A combustion chamber casing of a liquid-fuel rocket engine comprising a combustion chamber (1); a nozzle (2), consisting of a subsonic and a supersonic sections (3, 4) with an external structural envelope (8) and an internal fire wall (9) arranged inside said structural envelope (8) and made from copper or a copper alloy; and a regenerative cooling passage (10) formed between said structural envelope (8) and said internal fire wall (9), the inner surface of said internal fire wall (9) being provided with a metal coating consisting of two layers (11, 12) and arranged between the subsonic and supersonic sections (3,4) of the nozzle in the region of its throat over a length of not less than 0.3 throat diameter in the longitudinal direction, the first layer (11) of said coating being of nickel 50 µm to 1000 µm thick, and the second layer (12) of said coating located on the nickel layer being of chromium 10 µm to 500 µm thick."

X. The Appellant argued as follows:

Opposition and appeal have been filed by Mr Hummel for EADS Space Transportation GmbH in reference to the relevant general authorization AV-Nr. 48310, see point III above. Mr. Hummel might be employed by EADS Deutschland GmbH - which is why their address appears

on the letter head - but otherwise he was acting as a professional representative on behalf of EADS Space Transportation GmbH. There is no explanation why EADS Deutschland GmbH also figured in the signature, but it should be ignored.

The additional decision on the inadmissible opposition indicated on cover sheet 2330 of the notification of the decision differed from the decision announced at the oral proceedings and had taken the Appellant by surprise. This constitutes a serious procedural error and justified reimbursement of the appeal fee.

As for inventive step the citation in E2 of the RD0120 rocket engine with reference to E1 means that both be considered as one single instance of prior art. The main structural features of the combustion chamber casing as defined in claim 1 follow from E1. The mention of the RD0120 engine as example in the context of the main focus of E2 of copper (alloy) chambers implies that the cited RD0120 is also of copper. That engine has a Ni, Cr laminate coating. The only differences reside in the location and coating thicknesses specified in claim 1.

The most natural location to apply these thermal protective coatings is where fluid-mechanical load is highest.

As for the coating thickness, the tested nozzle segment described in section 3.2 of E2 already suggests a thickness value for the Ni coating within the claimed range. The 5 µm given in E2 for the Cr coating E2 may fall short of the claimed thickness range for Cr.

However, E2 suggests optimizing coating thickness, and the skilled person would arrive at values within that range by simple trial and error.

If E2 mentions that micro-fissures normally limit Cr coating thickness, it also indicates that a Ni intermediate layer solves this problem. Nor is the Cr coating mainly a chemical protective layer.

XI. The Respondent argued as follows:

It was unclear from the notices of opposition and the grounds of appeal who is filing on behalf of whom. Mr Hummel may be a professional representative, but there is no indication in the notices that he is acting in that capacity. Rather, the letter heading and that immediately preceding the signature, suggest he is acting only as an employee of EADS Deutschland GmbH and not as professional representative, so that it is that company that is actually filing the opposition and appeal for EADS Space Transportation. This follows also from the formulation in plural in the opening lines of the notice of opposition ("...we...file an opposition..."). One legal entity is acting for another. This means that neither the grounds of appeal nor the notice of opposition, signed by Mr Hummel for EADS Deutschland GmbH, are properly signed by the actual Appellant, EADS Space Transportation GmbH, and both appeal and opposition should be rejected as inadmissible.

Moreover, at the time of filing the appeal, EADS Space Transportation GmbH, having merged with another company,

was no longer existent as legal entity, and as such could not appeal.

Even if the passage in E2 describing an RD0120 rocket engine with Ni Cr laminate and referring to E1 are considered together as a single disclosure, that prior art fails to disclose a fire wall of copper or copper alloy, a minimal extent of the coating or the thicknesses as claimed.

As for the location of the coating, the cited figures and dimensions relate to ceramic not galvanic coatings. The thickness values given in E2 for galvanic Ni-Cr coatings apply to a cylindrical nozzle segment, not a nozzle. They cannot simply or obviously be transferred to a nozzle.

Moreover, where E2 mentions Cr coatings they serve mainly as chemical protective layer but are subject to micro-fissures. E2 indicates that the problem can be alleviated with an Ni intermediate layer, but nevertheless it will limit coating thickness. The 5 µm thickness value given in E2 for Cr is thus a maximum. The skilled person will need to at least double that value to reach the lower limit of the claimed range, but has no motivation to do so. This is all the more so as E2 includes on page 2 a clear instruction to keep the coatings as thin as possible. Additionally the skilled person would refrain from making thicker coatings out of cost and environmental concerns.

Coating the throat area of a copper or copper alloy firewall over a length not less than 0.3 throat diameters achieves optimal durability and production

cost. The particular thickness ranges moreover result in reduced thermal stress at the Ni-Cr interface. None of these measures is taught or suggested in E1 and E2.

XII. Oral proceedings before the Board were duly held on 20 December 2011. For further details, reference is made to the file.

Reasons for the Decision

1. *Admissibility of the opposition and the appeal*

1.1 During the oral proceedings the Respondent expressly acknowledged that the person of the (original) opponent has been clear from the very beginning and all through the procedure. The main objection against the admissibility of the opposition and the appeal is the missing signature, more precisely an "invalid" signature. The signatures in question as they stand must be considered to be the signature of EADS Deutschland GmbH. The invalidity is caused by the lack of power of EADS Deutschland GmbH, as a legal person, to represent EADS Space Transportation GmbH as a party before the European Patent Office. According to the Respondent, the undisputed fact that Mr Hummel was in fact a professional representative according to Article 134(1) EPC does not help the Opponent. The Respondent contends that as the documents on file did not indicate that Mr Hummel is acting in his capacity as a professional representative, this has the effect that his actions (here the signing of the grounds of appeal) are without legal effect, in the sense that these are not to be recognised as actions taken by a professional representative.

1.2 The board does not follow this line of argument for lack of any legal basis, as explained below.

1.3 As an initial remark, the board notes that an "invalid" signature can hardly have more serious consequences than a missing one. A missing signature only leads to

loss of rights if the deficiency is not remedied within a time limit after an invitation from the Office (Rule 50(3) EPC, last sentence). Even if the board were to find that the signature were missing or "invalid", it could not order the legal effect (inadmissibility) desired by the Respondent, but would have to invite the appellant to remedy the deficiency (Rule 50(3) EPC, second sentence). However, as will be further explained below, the board finds that the opponent was properly represented and all the documents, in particular the opposition and the grounds of appeal, were properly signed.

1.4 Article 134(1) EPC establishes that representation in proceedings before the European Patent Office is mostly the privilege of the professional representatives registered as such with the Office, with some exceptions which are not relevant here. Representation means the ability to make legal statements on behalf of the authorising party, with the legal effect that the relevant rights and obligations directly affect the authorising party, without any further confirming act of the latter. This is why a representative needs to be fully aware of the legal consequences of his actions, i.e. must have personally acquired the necessary professional competences to act for his client.

1.5 The above explains why representation is mostly restricted to professional representatives. Otherwise, the Office does normally not enquire for the specific conditions of employment between a party and the professional representative acting for the party, as long as the Office is satisfied that the representative is indeed authorised by the affected party to act as

such. This will normally have been expressed by the issuance of a formal power of attorney (authorisation) to the representative, but such power need not even be put in writing. The entitlement to represent is based on the factual existence of such a power, whether verbal or written, and the corresponding provisions of the Convention, Article 133 EPC, which specifically permit parties to act in the proceedings through a representative.

1.6 Article 134 EPC, which is dedicated specifically to professional representatives, concerns only the personal conditions for acting as such. Some further formal conditions for exercising the power to represent are regulated by Rule 152 EPC (Article 134 EPC 1973 and Rule 101 EPC 1973 is applicable for the notice of opposition, but the differences are not relevant here). The single formality this rule foresees is the filing of an authorisation. Rule 152(1) and (5) EPC further delegates power to the President of the European Patent Office to determine eventual further formal conditions which need to be fulfilled so that the professional representatives (and also others) may make effective use of their powers to represent. However, it is to be noted that Rule 152(1) EPC restricts the powers of the President to determine "the cases in which a signed authorisation shall be filed by representatives acting before the European Patent Office". This rule includes all types of representatives, and it is a further indication that the legislator foresaw the possibility for representatives to act before the European Patent Office without any special formalities. Similarly, Rule 152(5) EPC restricts the powers of the President to determine "the form and content" of authorisations.

1.7 The President made use of his delegated powers to regulate the question of authorisations in the "Decision of the President of the European patent Office dated 12 July 2007 on the filing of authorisations" (Special Edition No. 3, OJ EPO 2007, 128, hereafter "Decision"). However, neither Rule 152 EPC nor the Decision contains any formal requirement that the documents signed by professional representatives must indicate their basis of entitlement in order to be recognised as valid. It is true that Article 1(1), first sentence of the Decision states that a professional representative **who identifies himself as such** shall generally not be required to file an authorisation (emphasis by the board). Obviously, such an indication is useful and to be recommended, but it has no immediate legal effect *per se* if it is missing. Rule 152(2) and the President's Decision merely instruct the Office **how to proceed** in this case: The apparent representative is invited to furnish an authorisation (Article 1(3), 2 and 3 of the Decision). Obviously, such an invitation also permits the Office to enquire about the legal position of the apparent representative if this should not be clear from the submissions. Only when "a **required** authorisation is not filed in **due time**", i.e. following an invitation from the Office, will a legal consequence follow pursuant to Rule 152(6) EPC, namely that the applicable procedural step shall be deemed not to have been taken (emphasis by the Board). Still, even in this case the legal consequence is not caused by the initially missing indication (declaration) of the legal position of the apparent representative (i.e. the missing indication whether he is a professional

representative, a legal practitioner or an employee), but rather by the failure to prove that he has the powers and the entitlement to represent.

1.8 For sake of completeness, the same holds for the previous Decision of the President (Decision of 19.07.1991, OJ EPO 1991, 421) and Rule 101(4) EPC 1973 applicable at the time of filing the notice of opposition.

1.9 Moreover, neither any article or rule of the Convention, nor the Decision does preclude that the professional representative identifies himself retroactively. Such a retroactive identification may also obviate the need for a formal authorisation (see also T 850/96 of 14 January 1998, point 3.3 of the Reasons). This is also superfluous in most cases, given that the Office maintains a continuously updated register of the professional representatives entitled to act before the Office, and this register is easily accessible for all the involved parties.

1.10 Given the above, it is immaterial that Mr Hummel was probably an employee of a third party, and was using the address of his employer as the address of correspondence. It is equally irrelevant that probably out of habit, he also indicated his employer in his signature, thereby possibly implying that the signature is made on behalf of his employer, adding some confusion to the matter. But even this confusion does not detract from the fact that at the time of signing he was personally a professional representative registered with the European Patent Office (Article 134(1) EPC) and as such entitled to represent

the opponent and to sign on its behalf as well. For this signature, his own name and the indication that he is signing on behalf of the opponent was sufficient. Moreover, his entitlement to represent did not stem only from his personal qualification as a professional representative and some unidentified agreement between him and the opponent, but this was further evidenced by a general authorisation issued by the opponent and deposited with the Office. The registration number of the general authorisation (AV-Nr. 48310) was explicitly referred to under his signature. On the other hand, on the basis of the totality of the facts, the indication of EADS Deutschland GmbH in the signature objectively did not serve any identifiable purpose for the opposition procedure before the European Patent Office and therefore may be ignored. Whether it might serve some other purpose outside of this procedure need not be examined here.

1.11 Therefore, the board finds that the representative of the opponent, now appellant, did validly sign both the opposition and the notice of appeal in his capacity as professional representative.

1.12 The other argument advanced against the admissibility of the appeal is based on the fact that the original opponent, EADS Space Transportation GmbH did no longer exist by the time the notice of appeal was filed, and therefore no admissible appeal could have been filed in its name.

1.13 However, it is undisputed that EADS Space Transportation does presently have a universal legal

successor, and in fact did have one at all times during the proceedings.

1.14 It is true that a person, whether natural or legal, which has ceased to exist, cannot perform legal acts, or put differently, cannot acquire rights or obligations. Nevertheless, what matters in the present case is the fact that the rights and obligations of the ceased person - here EADS Space Transportation GmbH - have been transferred to its universal legal successor as a matter of national law, without any interruption in the existence of the rights and obligations (see also T 425/05 of 23 May 2006, point 1.2 of the Reasons). These rights and obligations include all substantive and procedural rights before the European Patent Office, no matter under what name they were established. The basis of the acquisition and the continued existence of these rights is the continuous factual existence of a person having legal capacity ("*Rechtsfähigkeit*", "*capacité juridique*") under the relevant national law, including the ability to legally succeed its legal predecessor. But the continuous existence and use of its original name is not required for maintaining the rights and serving the obligations, because the name is merely an identifier, an attribute of the person, but not a holder of rights. For the same reason, it is immaterial that the universal legal successor continued to use the original name in the proceedings before the European Patent Office. The fact that the legal succession has not been recorded with the Office does not preclude the continued actions of the legal successor under the previous name, as long as a legal successor exists and remains identifiable. This means that in the present case, from a legal point of view

the appeal has been filed on behalf of the universal legal successor of the original opponent existing at the relevant time, namely Astrium GmbH, even though the notice of appeal and the grounds of appeal were formally filed in the name of the original opponent EADS Space Transportation GmbH. This is why Astrium GmbH could later be recorded as the opponent and appellant, simply confirming towards the proprietor and third parties that it had been the original appellant all through the appeal proceedings. As such, it is not the same as a transfer of the opposition, which requires notification of and consent by the European Patent Office.

1.15 The legal conclusion argued by the respondent, namely that no legally valid actions can be taken in the name of the ceased person, would lead to untenable results. For example, the Office would not be able to take any action in the proceedings, because it would not be possible to notify communications or decisions, hence they would not be legally effective (see also T 425/05 of 23 May 2006, point 1.3 of the Reasons). Further, instead of relying on the subsequent filing of extracts from company registers in order to prove the changes in person, parties would need to declare immediately any changes in their person, in order to prevent any loss of rights. It would be most unrealistic to expect that any legal succession between natural or legal persons should be timed depending on actions which are to be expected from or need to be performed before the European Patent Office. Now given the fact that the legal successor of a party may not even be immediately known - a situation not uncommon in case of inheritance between natural persons -, such an immediate

declaration towards the office may simply prove to be impossible. It is also conceivable that a representative making legal statements to the Office on the basis of previous instructions from a party may not even be aware of a possible death or other form of cessation of his client, thus not even knowing that his actions are potentially invalid. This illustrates well why the arguments of the respondent cannot be followed.

1.16 Otherwise, the notice of the appeal and the grounds of appeal were timely filed and the appeal fees were paid. The grounds of appeal were sufficiently reasoned.

1.17 In conclusion, the board holds that the opposition and the appeal is admissible.

2. Inventive Step

2.1 The patent is directed at a combustion chamber casing for a liquid fuel rocket engine which comprises a combustion chamber and a nozzle with sub- and supersonic sections that have a copper or copper alloy internal fire wall within an (outer) structural envelope with a regenerative cooling passage between the two. The inner surface of the fire wall is protected at the nozzle throat section between sub- and supersonic sections over a minimum length of 0.3 throat diameter with a metal coating consisting of a layer of Cr in a thickness of 10 - 500 µm on a layer of Ni in a thickness of 50 - 1000 µm.

According to the patent, see specification paragraph [0010], this protective coating enhances the thermal stability of the inner fire wall in the most critical

area to extend the service life of the casing. The patent does not give an exact definition of what is meant by "thermal stability". From the discussion in the "Background" section the Board however infers that the term is closely linked if not synonymous to the casing's durability under the temperature regime to which it is subjected.

2.2 The closest prior art is disclosed in E2. E2 is a research paper on the development of thermal protective coatings for high performance rocket combustion chambers, see its title. E2's main interest, in common with the present patent, is service life extension in view of the high temperatures involved, see section 2: "Problemstellung und Lösungsansatz" (Problem formulation and solution approach), first paragraph. To this end it examines different coating concepts, page 1, right hand column 2nd complete paragraph. Sections 3 and 4 describe testing considerations for the different types of coating, while section 5 compares results and section 6 provides a final summary and evaluation.

Section 3.2, concerning galvanic (metallic) coatings is of particular interest, as it mentions application of a composite Ni-Cr coating in an existing RD0120 engine, page 4, right hand column, 2nd complete paragraph. The passage cites citation [9], corresponding to E1, for further detail of this engine. Thus, figures 1 and 5 of E1 show the typical shape of the combustion or thrust chamber of the engine, with a lower nozzle including sub- and supersonic sections separated by a narrow throat, cf. figure 1 of the patent. In the section "Thrust Chamber Cooling System", page 4, right hand column, 2nd paragraph, the chamber cooling circuit is

described as "formed by an inner liner with coolant passages and an outer shell"; this circuit is "regenerative", left-hand column of page 4, section "Thrust chamber cooling circuit analysis", first paragraph. In accordance with accepted practice, see e.g. the Case Law of the Boards of Appeal, 6th edition, 2010 (CLBA hereinafter), I.C.3.1, 2nd paragraph and the case law cited therein, these definitive features of a RD0120 engine as described in E1 may be regarded as forming a single, synoptic instance of prior art together with the passage in E2 citing E1 Given that E2 is generally concerned with the same problem as the patent, and cites the use of Ni-Cr coatings in the RD0120 engine in that context, that prior art can be considered as closest prior art for the purpose of assessing inventive step.

2.3 In the context of the cited RD0120 engine with Ni-Cr composite coating there is no mention of the fire wall material, the location of coating, or the respective thickness values of the constituent coatings. E2 does mention Cu, as well as a Ni thickness value of 0.25 mm within the claimed range (page 4, bottom of the right hand column). Similarly, coating location and extent can be inferred from dimensions given on page 3, right hand column, penultimate paragraph. In each case however these features appear in the *different* context of the model chamber nozzle segment or dummy tested in E2, and clearly do not form part of the disclosure regarding the RD0120 engine. More importantly, the only value given in E2 for the Cr coating, 5 µm, page 4, bottom right hand corner in reference to figure 5 - also for the dummy - lies *outside* the claimed range. The Board can but conclude that the claimed casing is

novel over the RD0120 engine with Ni-Cr coating described in E2/E1, differing in the features of the *copper or copper alloy* inner firewall, which is coated *in the region of the throat between the sub- and supersonic regions over a length of at least 0.3 throat diameter* with a *Ni coating that is 50 µm to 1000 µm thick, and on the Ni coating a Cr coating that is 10 µm to 500 µm thick.*

2.4 The patent does not give any particular reason for using copper or a copper alloy for the inner fire wall. That it might be linked in some way with the features of the coating is not apparent to the Board, nor has this been suggested. That feature and those of the coating can therefore be regarded separately and independently of each other when assessing inventive step.

2.5 Without further information, the use of copper (alloy) for the inner firewall addresses the problem of how to realize an inner firewall for a RD0120 engine as cited in E2 and described in E1.

The use of copper for the inner wall is however standard in combustion chamber design. E2 indicates as much in the first paragraph of section 2, when it refers to copper or copper alloy integral design of chamber combustions having proven itself ("mit der bewährten Brennkammer-Integralbauweise aus Kupfer bzw. Kupferlegierung"). No other material is in fact mentioned in E2; the tested model segments are invariably described as made of copper. If the skilled person does not already infer from this consistent mention of copper that the RD0120 engine cited by E2 in

that context must also have a copper (alloy) firewall, he will certainly read therein an obvious choice for realizing the engine's firewall.

2.6 As noted above, the patent links the coating and its specifics to the effect of providing thermal stability and an increased service life. This is also the gist of E2's teaching regarding thermal in coatings, and its citation of the RD0120 engine with Ni-Cr coating should be read in that context, i.e. as implying improved thermal stability and increased service life of its combustion chamber casing. This prior art instance thus already addresses the patent's central problem, and the problem associated specifically with the claimed coating thickness, location and extent must lie elsewhere.

2.6.1 Paragraph [0033] of the patent specification states that the thickness ranges are "optimal", with the coatings being sufficiently thick to be effective to protect the coating and increase its service life, but no so thick as to be economically unfeasible or impracticable.

As for the location and extent of the coating, claim 1 does set out a minimum requirement to ensure that at least the most critical area, in the throat, is coated (cf. specification paragraph [0010]). However, the claim does not impose any upper limit and in fact allows for coating the entire length of the firewall, a possibility expressly foreseen in the embodiment of figure 4, specification paragraph [0027]. If any effect is then to be associated with the location and extent as claimed across its full breadth, from minimum to

maximum protection, it is that it provides a broad optimum of protection, where what is optimum can vary depending on circumstances.

In conclusion, the claimed coating features - thickness, location and extent - set out the optimal conditions for the coating to take effect. The associated objective technical problem can be formulated accordingly as *how to optimize the Ni-Cr composite coating of a RD0120 engine such as described in section 3.2 of E2 with reference to E1*.

2.6.2 Turning first to the coating's location and extent, the skilled person requires no particular inventive insight to realize that he will achieve optimum or best protection if he applies the coating over the whole firewall interior along its entire length. This is what would first spring to mind as default. As noted this possibility is expressly described in the patent and covered by claim 1.

2.6.3 As regards the coating thickness, E2 in section 3.2, bottom right hand column and figure 5, already gives thickness values for the tested copper dummy of 5 µm for the Cr coating and 0.25 mm for the intermediate Ni layer. These values offer obvious starting points for the skilled person when tasked with optimizing the coating of an RD0120 engine with Ni-Cr coating. He will adopt them without any ado, as a matter of obviousness. The value for Ni is within the range claimed for Ni in claim 1.

2.6.4 However, the test dummy thickness value of 5 µm for Cr falls short of the claimed range's lower limit of 10 µm.

The question is then whether the skilled person has any reason to deviate from the 5 µm given in E2 for Cr, and, if so, whether he would then as a matter of obviousness seriously contemplate at least doubling that value.

2.6.5 E2 undoubtedly presents research results at an early, tentative stage of development with clear prospects of further development. This follows from the overview section on page 1, left-hand column, 2nd paragraph, where E2 states that it *studies* various coating *concepts*, that are of importance for *future generations* of rocket combustion chambers mentioned in the last bullet point of the lists on pages 3, 4, 5 and 7; from section 5 referring to *further procedure* on page 7, first paragraph and *feasibility* ("Machbarkeit"), top of the right-hand column on page 7; or from the last three paragraphs of the summary on pages 7 and 8, where E2 speaks of *potential* page 8, left-hand column, penultimate paragraph, and *suitability* in the context of further development of the coating concepts. E2 is in fact a feasibility study that opens the door to further research and development.

Not only does E2 suggest there is room for further improvement it also includes clear pointers as to which direction further development should take. Among various factors that E2 already considered in developing the galvanic coating test dummy, section 3.2, it mentions *optimization of Cr coatings with respect to thickness* (3rd bullet point of the right-hand column list). On page 7, top right-hand column, in the context of future development for galvanic coatings it again includes *optimization* of process technology as well as *coating properties* and *coating* as 3rd bullet point.

From these passages the skilled person infers that the Cr value given for the test dummy is by no means a set value, but is itself tentative and is open to further optimization. E2 effectively gives him a remit to try other Cr thicknesses.

2.6.6 Would he then seriously contemplate larger thicknesses? In the second paragraph of section 3.2 E2 notes that due to high internal stress Cr coatings are subject to micro-fissures ("Mikrorisse"). This normally limits thickness to below 0.25 µm, but, as E2 goes on, can be counteracted with a Ni intermediate layer. Indeed, the test dummy with Ni layer has a Cr thickness which is *20 times* that upper limit. This is a not inconsiderable increase. The magnitude of the increase teaches the skilled person that the Ni layer effectively frees him of the micro-fissure constraint. Considerably greater Cr thickness values are thus brought within reach. For this reason the skilled person will indeed seriously contemplate trying even greater thicknesses values than the single empirical value tentatively taught by E2. It is true that micro-fissures may still remain a concern - they are also listed on page 4 of E2 as an optimization criterion - but this only means that he will proceed with caution, not that he will not try larger values at all. The lower limit of 10 µm of the claimed range is then not so far removed from the of E2 (they are of the same order of magnitude) that the skilled person in his exercise of reasonable caution would not consider trying values within the lower region of the claimed range.

2.6.7 The Board thus confirms that not only would the skilled person in the light of E2's teaching consider, as a

matter of routine, obvious optimization, trying other Cr coating thicknesses, he would also in so doing seriously contemplate thicknesses at least twice the 5 µm value given in E2 for the test dummy.

2.6.8 The indication on page 2, the paragraph bridging the two columns, that coating thickness must be extremely thin, when read in context, the Board reads as applying exclusively to ceramic but not galvanic coatings. The immediately preceding paragraph discusses ceramic thermal coatings in the context of gas turbines, while the following figure 1 shows a cross-section of a combustion chamber with ceramic coating. The values given (0.02-0.05 mm) correspond with the maximum allowable thickness of about 0.03 mm shown in figure 2 for ZrO_2 ,a well known ceramic material. The latter figure shows thickness values for metallic coatings at least an order of magnitude larger than those for ZrO_2 if the same temperatures at the coating-to-firewall and cooling interfaces are to be achieved. The combined thickness of the dummy Ni-Cr coating of 0.255 mm is commensurate with those values and extrapolation of the graph in figure 2 appears to allow for even larger values.

2.6.9 Similarly, that E2 mentions the extreme thinness of ceramic coatings applied by PVD (section 3.3, first paragraph), does not mean that this is a general requirement. It rather highlights a comparative advantage of that particular coating technique, which makes it suitable for coating of chambers that have extremely small internal diameters, page 8, sentence bridging the two columns. It does not exclude the use

of the other techniques, e.g. when the chamber has internal features with larger dimensions.

2.6.10 Nor does the fact that a Cr coating has an important corrosion resistant effect militate against larger thickness values. This is again presented in E2 as a comparative advantage of this particular technique, which can be called upon if circumstances require it, page 8, left-hand column, penultimate paragraph.

2.6.11 Cost and environmental concerns are also not an absolute bar for the skilled person against trying a thicker Cr coating. In some situations they may indeed weigh heavily in the optimization process. However, in some technical fields, such as space technology, they may play no or only a very subordinate role.

2.7 Summarizing, copper or copper alloy is an obvious choice for a skilled person when realizing the firewall of an RD0120 engine with Ni-Cr coating as in E2/E1 because that is the standard for firewalls. It is also obvious for him to coat the entire firewall as this evidently provides optimum protection. To realize an optimal coating he moreover, as a matter of course, will draw on E2's initial dummy test study to provide him with first thickness values. E2 suggests further optimization for Cr coating thickness in particular, so that the skilled person will obviously try other values. These reasonably also include values at least double the test dummy value. These steps lead the skilled person to embodiments within the scope of claim 1 without the exercise of an inventive step.

Put otherwise these various steps constitute nothing more than a straightforward extrapolation of E2's tentative teaching. The effect of the coating as explained in the patent is exactly that as already described in E2. No other surprising effects or advantages are disclosed. The Appellant does now argue that the claimed thickness ranges reduce thermal stress at the interface between the two layers. Insofar as inventive step is to turn on such an effect (meaning that the effect forms the basis for the (re)formulation of the problem), it must however be derivable from the original disclosure when considered in relation to the prior art, cf. CLBA, I.D.4.4 and the case law cited therein. That is not the case here.

2.8 The Board concludes that the subject-matter of claim 1 lacks inventive step. Contrary to the decision under appeal, the Board thus finds that this opposition ground prejudices maintenance of the patent as granted. Pursuant to Article 101(2) and (3)(b) EPC the Board must therefore revoke the patent.

3. *Reimbursement of the Appeal Fee*

3.1 Besides stating that the opposition division has decided to reject the opposition, the cover sheet of the notification of the written decision, form 2330, includes an "additional decision" that "the opposition is ... rejected as inadmissible". This additional decision is not included in the decision duly announced at the oral proceedings as indicated on form 2309.2 of the minutes. Moreover, it conflicts directly with the division's finding recorded at point 9 of the minutes, and the reasons given under the corresponding heading

on pages 2 and 3 of the grounds of the decision. These record that admissibility was considered, but that the division found in favour of admissibility of the opposition.

3.2 The Board concludes on the face of these facts that the "additional decision" indicated on form 2330 is an obvious mistake, as it clearly does not reflect the division's intention as evident from the reasons and the minutes and the decision's announcement at the oral proceedings. The Board holds that such an obvious mistake does not constitute a substantial procedural violation which might have justified a reimbursement of the appeal fee under Rule 103(1)(a) EPC. The mistake may have caused initial surprise to the Appellant. However, the Board is unable to see how, once it became clear to the Appellant that it was a mistake and what the division's true intent had been, this might have deprived the Appellant of his rights or affected due process. As the Board finds no substantial procedural violation it concludes that a reimbursement of the appeal fee is not justified.

3.3 The proper remedy for obvious mistakes in decisions is provided by Rule 140 EPC. However, as the decision under appeal is to be put aside, the question whether or not to correct the decision is moot.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

3. The request for reimbursement of the appeal fee is refused.

The Registrar The Chairman

D. Hampe M. Ceyte