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D E C I S I O N
of 1 December 1999

Case Number: T 0212/98 - 3.2.2

Application Number: 93300823.7

Publication Number: 0559330

IPC: C23C 4/08

Language of the proceedings: EN

Title of invention:
Coated article

Patentee:
JOHNSON MATTHEY PUBLIC LIMITED COMPANY

Opponent:
Degussa-Hüls Aktiengesellschaft Patente und Marken Standort
Wolfgang

Headword:

-

Relevant legal provisions:
EPC Art. 54, 56, 83, 104

Keyword:
"Novelty (no)"
"Apportionment of costs (no)"

Decisions cited:
T 0595/90, G 0010/91

Catchword:

-



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Boards of Appeal

Chambres de recours

Case Number: T 0212/98 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 1 December 1999

Appellant: Degussa-Hüls Aktiengesellschaft
(Opponent) Patente und Marken
Standort Wolfgang
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Representative: -

Respondent: JOHNSON MATTHEY PUBLIC LIMITED COMPANY
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Representative: Wishart, Ian Carmichael
Patents Department
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 23 December 1997
rejecting the opposition filed against European
patent No. 0 559 330 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: W. D. Weiß
Members: R. Ries
R. T. Menapace

Summary of Facts and Submissions

- I. European patent No. 0 559 330 was granted on 16 August 1995 on the basis of European patent application No. 93 300 823.7.
- II. The granted patent was opposed by the appellants on the grounds that its subject matter lacks novelty or inventive step with respect to the state of the art (Articles 100(a) and 52 to 57 EPC and that the invention is not sufficiently disclosed (Articles 83 and 100(b) EPC).
- III. With its decision posted 23 December 1997 the Opposition Division held that the patent could be maintained in the form as granted and rejected the opposition. Amongst others, the following documents were considered in the opposition proceedings:
- D1: DE-A-2 007 056 & GB-A-1 242 996
- D2: US-A-4 159 353
- D6: G. Spur, Th. Stöfele, "Handbuch der Fertigungstechnik, Band 4/1, Carl Hanser Verlag, München, 1987, pages 480-490

The independent claims 1 and 8 of this set of claims read as follows:

- "1. A ceramic article for use at high temperature and in corrosive environments, comprising a refractory ceramic substrate on which is deposited a coating of one or more precious metals from the platinum

group of alloys thereof, said coating having a thickness of from 50 to 350 microns, characterised in that the external surface of the coating is non-porous."

"8. A process for making a ceramic article for use at high temperatures and in corrosive environments, comprising applying to a refractory ceramic substrate by combustion flame spraying a coating of one or more precious metals from the platinum group or alloys thereof in a thickness of from 150 to 350 microns, and treating the coating to make the external surface thereof non-porous."

IV. An appeal against this decision was filed on 24 February 1998 and the appeal fee paid on the same day. The notice of appeal was followed by a statement of grounds submitted on 30 April 1998.

V. In the appeal proceedings the patentees (respondents) referred inter alia to the following document:

D9: "Platinum Metals Review", January 1960, pages 2 to 9 and "Platinum Metals Review, April 1960, pages 48 to 55

In their response the opponents referred to

D11: Declaration of Mr M. Poniatoski, comprising exhibits A to E submitted on 29 September 1999

VI. Oral proceedings were held before the Board on 1 December 1999.

The appellants (opponents) requested that the decision of the opposition division be set aside and the patent be revoked, furthermore apportionment of costs for discussing the matter with their external expert against the patentees.

The respondents (patentees) requested that the appeal be dismissed and the patent be maintained in the form as granted. They declared at the oral proceedings not to maintain their previously filed request for apportionment of costs.

VII. The appellants argued as follows:

With respect to the meaning of the term "non-porous surface of the coating", it is agreed with the interpretation given in the patentee's letter of 29 September 99, page 5 that the "surface must withstand attack by molten glass and protect the ceramic parts from the highly corrosive effect of the molten glass". The coatings according to document D1 exhibiting a 4 to 5 mils thickness and made with platinum or platinum base alloy powder by plasma flame spraying and subsequent heat treatment are said to be impervious and impermeable to reactions between the underlying refractory and the molten glass in contact with the exposed coating surface. The benefits of the coating achieved by the process according to document D1 are apparent from the examples showing that the exposed coated surface was able to withstand attack by molten glass for seven or even ten days without forming blisters or seeds in the glass melt and, consequently, were "non-porous" within the meaning of claim 1. Hence the subject matter of claim 1 is anticipated by the

teaching given in document D1.

The patentees' additional tests are not suitable to prove their allegation that D1 does not enable a skilled person to achieve the predicted result. On the contrary, the screw plunger, described in Document D1 and produced according to the process in document D1 by plasma spraying a Pt coating followed by heat treating the coating at 1200°C, was operated satisfactorily in molten glass for months.

The same statement is true with respect to document D2 in which a thin platinum coating of about 3 mils (about 76 µm) obtained by plasma flame spraying on a ceramic substrate is made "impervious" or non-porous by pressure bonding thereupon a platinum sheet of suitable thickness. Conventional platinum sheet material comprises a thickness in the range of 200 µm to 300 µm or up to 700 µm.

Even if novelty with respect to document D1 or document D2 were acknowledged, the subject matter of independent claims 1 and 8 would lack an inventive step. These claims merely recite the problem to be solved, i.e. to minimize porosity, and the solution to the problem is to make the surface of the coating non-porous. However, no hint whatsoever is given in claims 1 and 8 as to how "non-porosity" could be achieved. Only dependent claim 9 mentions shot-peening, flame glazing or mechanical burnishing as densifying steps which are, however, well known to those skilled in the art to represent the typical aftertreatment for reducing microporosity and adherence of the coating. (cf. document D6, page 489, Chapter 2.4.3.1.6

Nachbehandlung).

In addition, the description of the patent is short and incomplete. No specific test is given in the patent about how "non-porosity" of the external coating surface should be proved. In view of the complexity of the spray technology, the influences of the selected method, technical equipment and variation of parameters upon the final product, the specification fails to give sufficient technical information which could enable a skilled person to successfully carry out the claimed process. Hence the patent does not meet the requirements of Articles 100(b) and 83 EPC either.

The respondents argued as follows:

As has been stated correctly by the opposition division in the impugned decision, the term "non-porous" means "able to protect the ceramic article from molten glass" which is a very aggressive medium. There are two known techniques of how to confer such protection to the substrate: by coating (comparable to a paint on a wall) or by cladding (comparable to wallpaper). Platinum sheet or foil used for cladding normally exhibits a thickness of about 500 μm and is not construed as falling within the scope of claim 1. On the other hand, coating a ceramic substrate by thermal spraying of platinum powder produces a spongy structured or "porous" layer which cannot be adequately or fully densified by a subsequent heat treatment as proposed in document D1. Such a coating is still liable to allow - to a certain extent - reactions between the ceramic substrate and the molten glass, thus forming oxygen bubbles and, in consequence thereof, frothing of the

molten glass. In comparison therewith, sprayed platinum coatings densified by shot peening which represents one way to achieve "non-porosity" according to the patent in suit and samples of which were presented at the oral proceedings, did not exhibit any frothing or bubbling in the glass test. It is not possible to give a particular "recipe" for the shot peening step, since the process parameters strongly depend upon the selected alloy composition and/or thickness of the platinum coating. The optimum parameters for the shot peening step can be easily evaluated by the practitioner in routine tests. Hence, there is no lack of disclosure of the patent in suit.

Although document D1 purports to provide an impermeable platinum barrier on the ceramic substrate by using the word "impervious" in a number of places, this process actually does not produce a "non-porous" coating as claimed in the patent. On the one hand, this has been impressively demonstrated by the patentees' test results, and no other repetition of the teaching given in D1 has proved that the surface of this coating in fact is "non-porous". Also the appellants' test results in document D11 concerning the platinum coated screw plunger cannot prove the contrary, since the coating was not performed according to the process given in D1. In particular, the selected particle size range, the temperature of the post heat treatment (1200°C) and the thickness of the coating obtained are outside the process parameter specified in document D1. Moreover, the test results according to D11 are submitted late and do not correspond to the tests announced with the opponents' grounds of appeal. Therefore, these results should not be admitted to the proceedings.

The assumption of the appellants that the absence of seeds and blisters mentioned in the examples of D1 results from a "non-porous" coating is fallacious since such effects only arise if there were gross defects in the surface.

In any event, the teaching of document D1 is non-enabling as regards what it purports to teach, and the meaning of "impervious" in D1 must be different from the property "non-porous" claimed in the patent. This evaluation of the contents of document D1 is supported by document D2, where pressure bonding a platinum sheet of suitable thickness on a plasma sprayed coating is resorted to in order to make the platinum coating impervious (see D2, column 4, lines 13 to 18). Thus, if a skilled person cannot make it work, the process and the coating produced therewith according to D1 must be regarded as being merely a "desideratum". Contrary thereto, the patent says for the first time how to produce a "non-porous coating surface". In this context, decision T 595/90 (headnote point II) is referred to, where the Board held that "a product that can be envisaged as such with all the characteristics determining its identity together with its properties in use - that is an otherwise obvious entity - may become nevertheless non-obvious and claimable as such, if there is no way or applicable method in the art to make it and the claimed methods for its preparation are, therefore, the first to achieve it in an inventive manner". This situation applies to the present case. The claimed coating and the process to produce it are, therefore, novel and involve an inventive step.

Reasons for the Decision

1. The appeal complies with the formal requirements of Articles 106 and 108 and Rules 1(1) and 64 EPC. It is therefore admissible.

2. *Admissibility of the late filed tests*

The opposition division, having considered the results presented in prior art documents as a whole, concluded in point 4.6 of the decision under appeal that sprayed and densified platinum coatings produced by the technique according to D1 should be regarded as being "porous". In response to this finding, the appellants informed the Board in their statement of grounds filed on 2 June 1998 that they had started long term tests, the results of which would be submitted as soon as possible. Enclosed with their letter of 28 September 1999, i.e. two months before the oral proceedings, the test results (document D11) were filed at the EPO and concurrently sent to the respondents. Hence, there was sufficient time for the respondents and for the Board to study and consider the technical content of document D11. The tests, which were not challenged in substance by the respondents, had been performed in an industrial glass production line for four months in order to make sure that any possible interpretation of the vague test conditions according to the patent in suit to assess non-porosity is met. Document D11, thus filling a gap in the appellants' previous reasoning, is highly relevant to the present case to answer the question of whether the disclosure of document D1 - which since the opposition proceedings has been considered as closest prior art - is feasible or not. The respondents'

reference to the decision G 10/91 has no bearing on the matter, since document D1 has been already considered in the opposition proceedings. The appellants' tests, demonstrated in document D11, aimed at proving the feasibility of this process which had been denied in the decision under appeal. Consequently, document D11 only adds support to a ground which had already been based on document D1. Therefore, the Board admitted document D11 into the procedure.

3. *Article 100(b) EPC; enabling disclosure*

In support of their argument that the technical teaching of document D1 is not an enabling disclosure for a skilled person and that the product described in D1 merely represents a "desideratum" within the meaning of decision T 595/90, the respondents, by their letter of 10 October 1997, submitted own test results which showed frothing of the glass on a platinum coating which had not been densified by shot-peening.

In contrast thereto, the appellants, essentially following the teaching given in document D1, have actually produced a platinum coated ceramic substrate exhibiting a surface which is "non-porous" to molten glass within the meaning defined in claim 1 and of the opposed patent as a whole (see document D11). Since the delivery of the screw plunger for a service trial was taken as a basis for an action of infringement against the appellants, the respondents have implicitly conceded that the platinum coated plunger described in D11 in fact has the "non-porous" property required in the patent in suit and, therefore, falls within the scope of claim 1 of the patent at issue. Moreover, the

respondents have not doubted the details of the process given in D11 which was used to produce the said platinum coated test plunger. Although this process did not include a densification of the coating by shot-peening, the plunger was satisfactorily operated in contact with molten glass for months, as described by the appellants in document D11. It is true that according to the test process only 50% (instead of 100% as required in D1) of the platinum particles had a size within the range of 20 to 44 μm and that the temperature of 1200°C was below the minimum temperature of 1250°C as required by claim 1 of document D1. These deviations have, however, no negative bearing on the matter because they only prove that the requirements given in D1 are even more stringent than necessary to achieve an adherent impervious platinum coating which guarantees long term protection of the underlying ceramic substrate from corrosion by the molten glass.

It follows from the above that a skilled person who aims at producing a non-porous platinum coated ceramic article impermeable to reactions with molten glass, has been able to do so when putting into practice the technical teaching given in document D1. It may be true that the appellants' experiments show that the process described in D1 does not in all circumstances and in its broadest aspects successfully lead to a non-porous product. As has been demonstrated by the analysis of the patent in suit by Mr Chandler annexed to the appellant's letter of 20 September 1999, this statement is also true for the patent in suit. Since according to the established jurisprudence, a technical teaching is not insufficiently disclosed if, on encountering occasional lack of success despite strict adherence to

prescribed limits for certain variables, there is enough information concerning the effect of those variables to enable a skilled worker to achieve success and if only routine experiments are necessary to convert failure into success. The Board is convinced that the patent in suit still fits this standard and, therefore, meets the requirements of Article 100(b) EPC. Since the specifications given in document D1 are not less detailed, the application of the same standard to its disclosure must necessarily lead to the conclusion that it is equally enabling as the one of the patent in suit.

In view of these considerations, the technical subject matter disclosed in document D1 does not represent a mere "desideratum" and - following the approach taken in decision T 595/90 - therefore is suitable to anticipate the claimed subject matter.

4. *Novelty*

Claim 1 of the patent in suit defines an external surface of the platinum or platinum alloy coating which is "non-porous". The Board concurs with the position of the opposition division on this point that this term is not unambiguously defined in the patent and, considering the patent as a whole, claim 1 is construed as meaning a surface of a Pt-coating which is able to withstand molten glass and to protect the underlying ceramic substrate from attack by molten glass. This interpretation is supported by the examples of the disputed patent in which the platinum coating was found to be "protective" or "fully protective" to the substrate.

Like the patent in suit, document D1 GB-A-1 242 996 is concerned with a platinum or platinum base alloy coating on a refractory material so as to protect against reactions between the refractory and molten glass or other hot substances in contact with the coating. In particular, the plasma sprayed platinum coatings are specified to be impervious, continuous and adherent to the refractory (cf. D1, page 1, lines 11 to 23). The coatings having a thickness of 4 to 5 mils (102 to 127 μm) are made impervious and impermeable to reactions between the underlying refractory and the molten glass by utilizing a spray velocity of at least 100 feet/second, by selecting a narrowly ranged particle size of Pt-powder (20 to 44 microns) and by heating the coating on the refractory to a temperature of at least 1250°C (cf. page 2, lines 10 to 33; lines 81 to 92). If desired, the surface of the coating can be further smoothed by suitable grinding and polishing (cf. page 2, lines 93 to 99). As set out in the examples 1 and 3 given in document D1, the molten glass on the coated heat treated blocks (static contact, 1250°C) did not contain any blisters or seeds after 7 days (example 1) or 1 day (example 3; 1450°C). In examples 2 and 4, the heat treated coating was placed in contact with a mass of flowing glass at 1500°C for 7 days (example 2) without observing blisters or seeds in the glass. The examples given in document D1, therefore, attest to the impervious or "non-porous" nature of the platinum coating in that reactions between the molten glass and the ceramic material have not been observed. Consequently, the subject matter of claim 1 is anticipated by the disclosure of document D1.

As to the patentee's arguments relating to the meaning of the terms "impervious or impermeable to reactions" in document D1 and "non-porous" used in the patent in suit, it is noted that the patent specification does not comprise a particular test method in order to verify the general property "non-porous". Thus the criterion whether or not the platinum coating acts as a "reliable barrier" to protect the ceramic substrate from reacting with the molten mass of glass is left as the decisive one. The platinum coatings according to document D1 were found to withstand attack by molten glass for seven days or more and, therefore, this property cannot have been achieved other than by the process disclosed in document D1. Hence, contrary to the patentee's position, the feature "impervious" or "impermeable to reactions" in document D1 must be equated with the feature "non-porous" given in claim 1 of the patent in suit.

Nor can the Board recognize any contradiction between the teaching of document D2 and D1. D2 essentially aims at increasing the adherence or peel strength of the platinum coating on hard dense refractories rather than making the Pt-coating impervious. To this end, an intermediate oxide layer was applied interjacent to the ceramic substrate and the platinum coating. Strong mechanical bonding of the platinum to the intermediate oxide layer is achieved by the platinum forming roots with the pores and crevices of the rough oxide layer and tenaciously adhering thereto. In a specific example given in column 4, lines 13 to 18 of document D2, a very thin platinum coating of 3 mils (76 μm) - thus having a thickness lower than that in D1 (4 to 5 mils corresponding to 102 to 127 μm) - was made impervious

by cladding it with a sheet of platinum of suitable thickness. Although the final thickness of the double (= sprayed and clad) Pt-coating is not known from document D2, a "suitable platinum sheet thickness" of about 250 µm would be adequate as alleged by the appellants at the oral proceedings. This is corroborated by document D9 page 49, left hand column to right hand column, second paragraph and page 55, left hand column, lines 16 to 25. Hence, such a double Pt coating would still be within the scope of claim 1 of the disputed patent.

In view of these considerations, the subject matter of claim 1 is not novel and claim 1, therefore, not allowable.

6. *Apportionment of costs*

According to Article 104(1) EPC a deviation from the rule that each party of the proceedings shall meet its own costs is only possible for reasons of equity. More specifically, a party which behaves or acts in the proceedings in breach of its equitable obligations or in an irresponsible or even malicious manner, may have to bear the costs it caused thereby to other parties.

The appellants' discussion with their expert were, without any doubt, not the consequence of any unfair conduct on the party of the respondents. Rather, they were a means of the appellants' choice within their endeavour to defend their position and to challenge that of their adversary. Thus, there is no ground for awarding the respective or any other costs to the appellants.

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 apportionment of costs is rejected.

The Registrar:

The Chairman:

N. Maslin

W. D. Weiß