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D E C I S I O N
of 19 January 1995

Case Number: T 0799/90 - 3.2.2

Application Number: 85106686.0

Publication Number: 0172325

IPC: C23C 14/16

Language of the proceedings: EN

Title of invention:
Steel article having a disordered silicon carboxynitride coating, and method of preparing the coating

Patentee:
Ovonic Synthetic Materials Company, Inc.

Opponent:
N.V. Philips' Gloeilampenfabrieken

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes) after amendment"

Decisions cited:
-

Catchword:

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0799/90 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 19 January 1995

Appellant: (Proprietor of the patent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office dated 17 August 1990 revoking European patent No. 0 172 325 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: H. Seidenschwarz
Members: R. Lunzer
M. Aúz Castro

Summary of Facts and Submissions

I. European patent No. 172 325 was granted on 10 August 1988 on the basis of application No. 85 106 686.0, filed on 30 May 1985, claiming a priority date of 27 June 1984 based on US application No. 625058.

II. On 2 May 1989 an opposition was filed on the grounds of Articles 100(a) and 100(b) EPC, alleging lack of novelty (Art. 54 EPC), lack of any inventive step (Art. 56 EPC), and lack of a sufficiently clear and complete disclosure (Art. 83 EPC). The Opponent relied on the following documents:

(1) A. Grill et al., Thin Solid Films, 108 (1983), pages 173-180, and

(2) EP-A1-0 030 638.

III. The Patentee (Appellant) did not respond to the submissions of the Opponent (Respondent). By its decision given in writing on 17 August 1990, the Opposition Division revoked the patent. It found that Claim 1 lacked novelty over the disclosure of document (1), which, although concerned with silicon nitride coatings on stainless steel substrates, mentioned at page 176 the detection of carbon and oxygen lines in the X-ray spectrographs there shown, these elements being present due to contamination of the silicon nitride deposits. As the silicon carboxynitrides of the claimed compositions had no fixed chemical meaning, the coatings disclosed in document (1) could be regarded as silicon carboxynitride coatings falling within the scope of Claim 1, which therefore lacked novelty.

The process Claim 11 was held to be novel over the cited documents. However, as the product was not novel, the production of that product was an obvious problem, and the features distinguishing Claim 11 from the prior art processes did not appear to result in any special effects. The defined process steps merely ensured that a particular substrate would be provided with a layer containing all four essential elements. That process was held not to be inventive.

IV. An appeal against that decision was filed on 9 October 1990, the appeal fee was paid on the same day, and the Statement of Grounds of Appeal was filed on 14 December 1990. Together with its said Statement the Appellant filed a revised set of 8 claims. Pursuant to a communication from the Board dated 29 July 1994 requesting the correction of a few minor errors in the description and claims, the Appellant filed a revised draft of Claims 1 and 2 and a revised description on 20 September 1994. Claims 1 and 2 as considered on appeal are in the following form, Claims 3 to 8 being dependent on Claim 2:

"1. Stainless steel article having an adherent, ductile, corrosion resistant, disordered, nonstoichiometric silicon carboxy-nitride coating thereon, prepared by r.f. depositing the coating onto the stainless steel substrate (55) in a gas comprising nitrogen,
c h a r a c t e r i z e d i n t h a t
said carboxy-nitride coating is transparent and has a thickness in the order to 10 nm and comprises a compound of up to 10 atomic percent boron and/or phosphorus besides the compounds of carbon and oxygen in said silicon carboxy-nitride matrix."

"2. Method of producting a stainless steel article having an adherent, ductile, corrosion resistant, disordered, nonstoichiometric silicon carboxy-nitride coating thereon, comprising the method steps of

a) bringing the stainless steel substrate (55) into a vacuum deposition chamber (11) and maintaining it in a vacuum;

b) injecting a gas mixture comprising nitrogen into said deposition chamber (11),

c) applying radio frequency energy for depositing said silicon nitride onto said stainless steel substrate (55),

c h a r a c t e r i z e d i n the following steps:

b1) injecting a gas mixture further comprising a silicon containing gas, carbon containing gas, an oxygen containing gas and a boron compound and/or a phosphorus compound;

c1) applying microwave radiation from a microwave source (31) having frequencies in the GHz range as said r.f. energy;

d) forming and maintaining a plasma in said deposition chamber (11) under conditions to plasma deposit a carboxynitride coating comprising boron and/or phosphorus."

V. The Appellant contended that the objections on which the decision under appeal had been based were inapplicable to the amended Claims, the coating as now claimed being much thinner than those disclosed in document (1), apart from being intended for a wholly different purpose, while document (2) was directed to the different problem of making films of the kind encountered in semi-conducting devices, such as transistors and

photo-electric cells, by vapour deposition at 250 to 350 °C. Neither of these documents would have suggested to the skilled person in the art the product or process of the present Claims 1 and 2.

VI. The Appellant requested that the decision under appeal be set aside, and the patent be maintained on the basis of the claims filed with its Statement of Grounds of Appeal, as revised by its letter filed on 20 September 1994, together with the description as amended filed on the same date, and the single Figure of the application as filed. The Respondent took no part in the appeal.

Reasons for the Decision

1. The appeal is admissible.

2. *Admissibility of amendments*

2.1 The amendments to the claims are admissible for the purposes of Articles 123(2) and 123(3) EPC. The further limitations which have been added to the amended claims narrow their scope, so that the protection conferred has not been extended contrary to Article 123(3). As for the disclosure of the added features in the application as filed, the features added to Claim 1 are to be found in the combination of Claims 1, 2, 7 and 9 of the application as filed, as well as in its description at page 5, line 8, and page 9 in the second and third paragraphs, corresponding to col. 3, line 45, and col. 5, line 64 to col. 6, line 22, of the patent as granted.

2.2 Similarly, in connection with the amended Claim 2, reference is made to Claims 18, 24 and 25 of the application as filed, and its description at page 6,

lines 10, 19 and 33-36, page 8, lines 15-35, and page 11, first paragraph. The said passages correspond respectively with col. 4, lines 18, 27-28 and 42-44, col. 5, lines 29-50, and col. 6, line 61 to col. 7, line 5, of the patent as published.

2.3 Regarding the dependent claims, Claim 3 is based on the disclosure of Claim 13 of the application as filed, corresponding to Claim 12 of the patent as granted. Claims 4 and 5 are both based on Claim 20 of the application as filed, corresponding to Claim 13 of the patent as granted.

Claim 6 is based on Claim 23 of the application as filed, corresponding to Claim 16 of the patent as granted.

Claim 7 is based on the disclosure of page 13, lines 9 and 10, of the application as filed, corresponding to col. 8, line 14, of the patent as granted.

Claim 8 is based on the disclosure of page 13, lines 23 to 24, of the application as filed, corresponding to col. 8, lines 28 to 29, of the patent as granted.

3. *Novelty*

Having reviewed the cited documents, the Board is satisfied that none of them discloses either a product or a method having all the features defined in Claims 1 and 2. Therefore the subject matter of these claims is considered to be novel within the meaning of Article 54 EPC. Novelty being uncontested at the appeal stage, more detailed reasons are unnecessary.

4. *The invention*

4.1 The patent in suit is concerned with the production of extremely thin (10 nanometers) silicon carboxynitride coatings on stainless steels for the sake of improving corrosion resistance. Although the patent in suit describes in detail at col. 6, lines 23-55, a method for testing corrosion resistance, and at col. 7, line 6 to to col. 8, line 61, in association with the single Figure, both an apparatus and a method of depositing the desired coating, there is in fact no example of a gas composition actually tested, nor is there any description of any corrosion test carried out on a product made in accordance with the alleged invention.

4.2 Nevertheless, it is credible that ultra thin coatings of the kind defined in Claim 1 are strongly adherent, ductile and corrosion resistant. Corrosion resistance stems from the chemical composition of the deposit, while an extremely thin coating is inherently likely to be adherent and ductile.

Although there is no numerical limitation on the thickness of the coating in Claim 2, the Board accepts in connection with the description at col. 6, lines 11-17, that the order of thickness of 10 nm may not be exceeded if the coating is to have the other desired qualities of adherence and ductility which are specified in Claim 2.

5. *Inventive step*

5.1.1 Document (1), which was treated as the closest prior art in the decision under appeal, relates to the deposition of silicon nitride coatings on stainless steels for purposes primarily directed to wear resistance, but "chemical stability", which may be regarded as

equivalent to corrosion resistance, is mentioned at page 173, last paragraph. In contrast to the product of Claim 1 of the patent in suit, the coating disclosed in document (1) is silicon nitride, not silicon carboxynitride, and it has a thickness of 1 micron (cf. the scale indicators on the photomicrographs Figs. 1 and 2) i.e. it is some 100 times thicker than that now claimed.

5.1.2 Although in the decision under appeal the view was expressed that the compositions are similar, because Fig. 3 on page 176 of document (1) includes an X-ray spectrograph in which the presence of traces of oxygen and carbon are shown, they are in fact described in the text on the same page as being contaminants. The Board does not accept that the detection of traces of a contaminant by the ultra-sensitive tool of X-ray spectrum analysis in what is intended to be a deposit of pure silicon nitride is equivalent to a teaching of depositing silicon carboxynitride. It follows that as the teaching of document (1) relates to the deposition of a different substance at a thickness some 100 times greater than the coating which is the subject-matter of Claim 1, it cannot render that subject-matter obvious.

5.1.3 Turning to the process Claim 2, its essential features include:

b1) the presence of a carbon containing gas, and an oxygen containing gas, and

c1) using microwave radiation having frequencies in the GHz range.

None of those features is disclosed or suggested by document (1), and the Board therefore concludes that the attack on this Claim fails too.

5.2.1 The teaching of document (2) is equally remote from the alleged invention. It is concerned with the deposition of silicon or germanium containing films to form insulating or semiconducting films for semiconducting devices, such as diodes, solar cells, and transistors (cf. page 1, and page 15, lines 6 to 9). Although at page 5, lines 15 to 18, there is a mention of using at least one gas reacting with silane, which gas is selected from oxygen, nitrogen, carbon and boron, the closest that it comes to any disclosure of deposition onto a stainless steel substrate is the reference to "metals" at page 6 line 23.

5.2.2 This document is as remote from the teaching of the invention as is document (1), and consequently cannot be regarded as a sound basis for challenging inventiveness, whether taken alone or read in combination with document (1).

5.3 Accordingly the Board is satisfied that an inventive step is involved in each of the independent Claims 1 and 2, and that therefore the requirements of Article 56 EPC are satisfied.

6. *Article 83*

The objection under Article 83 EPC (insufficiency of disclosure) raised before the first instance was not repeated on appeal by the Respondent. The Board is not satisfied that this ground of objection has been established.

7. *Conclusion*

Claims 1 and 2 being allowable, the same applies to dependent Claims 3 to 8, which are method claims dependent on Claim 2, and whose inventiveness is supported by that of Claim 2.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the Opposition Division with the order that a patent be maintained on the basis of Claims 1 to 8, and the amended description referred to in paragraph VI above, as well as the single Figure of the patent as granted.

The Registrar: The Chairman:

S. Fabiani H. Seidenschwarz