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Datasheet for the decision of 4 June 2008

Case Number: T 1571/05 - 3.3.03

Application Number: 97303004.2

Publication Number: 0806445

IPC: C08G 59/18

Language of the proceedings: EN

Title of invention:
Two component powder coating system and method for coating wood therewith

Patentee:
MORTON INTERNATIONAL, INC.

Opponent:
Hexion Specialty Chemicals Research Belgium S.A.

Headword:
-

Relevant legal provisions:
EPC Art. 56, 100(a)

Keyword:
"Inventive step - problem and solution"

Decisions cited:
-

Catchword:
-

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Case Number: T 1571/05 **-** 3.3.03

D E C I S I O N
of the Technical Board of Appeal 3.3.03
of 4 June 2008

Appellant: (Opponent)
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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office dated 5 September 2005 and posted 26 October 2005 concerning maintenance of European patent No. 0806445 in amended form.

Composition of the Board:

Chairman: C. Idez
Members: A. Däweritz
E. Dufrasne

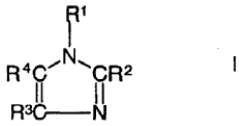
Summary of Facts and Submissions

I. The grant of European patent No. 0 806 445 in respect of European patent application No. 97 303 004.2, filed on 1 May 1997 and claiming the priorities of 6 May 1996, 11 October 1996 and 4 March 1997 of three earlier applications filed in the U.S.A. (643694, 729608 and 810745, respectively), was announced on 13 August 2003 (Bulletin 2003/33). The patent was granted with seventeen claims, including the following claims to:

1. A two-component coating powder blend comprising

A) an extruded mixture of a self-curing epoxy resin and

i) a catalyst comprising an epoxy adduct of an imidazole having the general formula:



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wherein R^1, R^2, R^3 and R^4 are independently hydrogen or any substituent which is not reactive with the epoxy resin, and/or
ii) a low temperature curing agent, active at 93°C (200°F) or less in an amount insufficient to cause substantial curing of the resin during extrusion, and

B) a separate amount of the same or a different low temperature curing agent, active at 93°C (200°F) or less, sufficient to complete the cure, said extruded mixture and said low temperature curing agent both being in powder form.

2. A coating powder according to claim 1 wherein the weight ratio of said low temperature curing agent (i) to said catalyst (ii) is from 2:1 to 15:1.

10. A method for coating wood comprising electrostatically spraying a coating powder according to any preceding claim onto a surface of the wood to a thickness of from 76 to 153 mm (3 to 6 mils), and heating the powder to a temperature of from 82°C (180°F) up to but not including the decomposition temperature of the blend.

12. A method according to claim 10 or claim 11 in which competing reactions take place simultaneously, said reactions being:

A) a catalyzed self-curing of a portion of the epoxy resin catalyst comprising an epoxy adduct of an imidazole having the general formula I defined in claim 1, and
B) a crosslinking reaction between another portion of the epoxy resin and said low temperature curing agents.

17. An article comprising a substrate coated with a cured coating powder according to any one of claims 1 to 9.

The remaining claims 3 to 9, 11 and 13 to 16 were all dependent claims.

In this decision, references to passages in the patent in suit as granted will be given underlined in squared brackets, those to passages in the application as filed will be shown in underlined italics, eg [Claim 1], [0001], [Example 1], *Claim 1*, *page 1, line 1* and

Example 1, respectively. "EPC" refers to the revised text of the EPC 2000, the previous version is identified as "EPC 1973". "CA" means "curing agent".

II. On 10 May 2004, a Notice of Opposition was filed, in which revocation of the patent in its entirety for the grounds for opposition according to Articles 100(a) and 100(b) EPC 1973 was requested. However, the latter ground was withdrawn at oral proceedings before the Opposition Division held on 5 September 2005.

(1) More particularly, the Opponent referred to Articles 52(1), 54 and 56 EPC 1973 and asserted lack of novelty and lack of inventive step with regard to

D1: US-A-3 842 035

(2) In the course of the opposition proceedings, the Patent Proprietor filed an experimental report (letter dated 5 July 2005) and two auxiliary requests. These auxiliary requests did not, however, play any role in those proceedings. Besides, further documents were cited by the parties, so that, at the end of the opposition proceedings, their number had reached a total of eight.

(3) Then, at the above oral proceedings, the Patent Proprietor amended its Main Request and paragraphs [0012] and [0013] and marked [Examples 2, 4, 10 and 15] as being comparative. Whilst Claims 1, 3 to 9, 11 and 13 to 16 remained unchanged, the remaining claims were amended as follows:

"2. A coating powder according to claim 1 wherein the weight ratio of said low temperature curing agent (ii) to said catalyst (i) is from 2:1 to 15:1.

10. A method for coating wood comprising electrostatically spraying a coating powder according to any preceding claim onto a surface of the wood to a thickness of from 76 to 153 μm (3 to 6 mils), and heating the powder to a temperature of from 82°C (180°F) up to but not including the decomposition temperature of the blend.

12. A method according to claim 10 or 11 in which competing reactions take place simultaneously, said reactions being:

A) a catalyzed self-curing of a portion of the epoxy resin and a catalyst comprising an epoxy adduct of an imidazole having the general formula I defined in claim 1, and

B) a crosslinking reaction between another portion of the epoxy resin and said low temperature curing agents.

17. An article comprising a heat sensitive substrate selected from plastics, paper, cardboard and wood, coated with a cured powder according to any one of claims 1 to 9."

III. In the interlocutory decision announced at the end of the above oral proceedings and issued in writing on 26 October 2005, the Opposition Division decided that, "Account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it relates are found to meet the requirements of the Convention."

(1) From the list of documents additionally cited during the opposition proceedings (section II(2), above), the following prior art was considered relevant and, therefore, admitted into the proceedings (cited by the Patent Proprietor = "P", by the Opponent = "O"):

D2: US-A-5 414 058 (P),
D7: Technical Bulletin Shell: EPON CURING AGENT® P-101 (September 1992) (O) and
D8: D.S. Richart, "Applying powder on a wooden substrate", Powder Coating, April 1996, pages 55 to 56 (P).

The further documents filed by the Opponent were not admitted under Article 114(2) EPC 1973 (No. II.3 of the reasons) for one of two reasons, ie because their exact publication date could not be established beyond reasonable doubt or they were not found more relevant than the documents that had already been on file.

(2) The amendments in the claims (section II(3), above) were deemed allowable under Articles 123(2) and 123(3) and Rules 57a and 88 EPC 1973.

(3) According to the decision under appeal, Dl disclosed a two-component coating powder comprising the so-called "slow" curing composition A) being a mixture of an epoxy resin and a CA, which could be an adduct of aromatic amines with liquid mono-epoxides, and the so-called "fast" curing composition B) being a mixture of an epoxy resin, a CA and a curing accelerator, wherein the curing accelerator might have been an adduct of imidazoles with mono- or polyepoxides. Components A) and B) were prepared separately in an extruder. The coating powder composition was then prepared by dry mixing A) and B) and the mixture was applied to the

surface, possibly including metal surfaces, of the article to be coated by heating to 120°C to 200°C. As regards epoxy based powders, a temperature range of 175 to 185°C was referred to.

(4) The composition of D1 was, therefore, found to differ from the subject-matter of Claim 1 in that, in Dl, an epoxy resin was present in both components, ie also in its component B), and the amount of CA was the same in both components. By contrast, component B) of the patent in suit comprised, as argued by the Patent Proprietor, only a low temperature CA to make up the balance of such agent "missing" from component A) of Claim 1 and there was no teaching in Dl that the CA in component A) was present in an amount insufficient to cause curing during extrusion. For these reasons, the subject-matter of claim 1 was held novel over D1.

(5) Document D7 disclosed, according to the decision under appeal, the use of EPON Curing Agent® P-101 in epoxy resin powder coating compositions for temperature sensitive substrates. However, there was no teaching in D7 concerning a blend of an extruded mixture of epoxy resin and a low level of a CA, on the one hand, and of a separately CA in powder form, on the other hand. Consequently, the subject-matter of Claim 1 was deemed novel vis-à-vis D7.

(6) No novelty objection had been raised against the subject-matter of Claim 10, anyway, and the subject-matter of Claim 17 involved a particular substrate, not mentioned in either D1 or D7. Furthermore, D8 referred to the use of blocked isocyanates as catalysts or curing agents. However, blocked isocyanates active at low temperatures were not, according to D8, available.

Consequently, the subject-matter of these claims was found to be novel over each of D1, D7 and D8.

(7) Whilst D1 was considered by the Opponent as the closest piece of prior art, the Opposition Division took the view, that D1 did not concern the preparation of storage stable powder coating compositions for heat sensitive substrates. Therefore, it considered D7 as the closest prior art, which disclosed the application of epoxy resin powder coatings to temperature sensitive substrates and the curing of these coatings at temperatures down to 121°C. However, in D7, the CA, instead of being added separately, was solubilised in the resin during the melt-mix processing step in an extruder and then pulverised.

(8) The problem to be solved with regard to D7 was seen in the provision of a new powder coating composition allowing a faster cure at lower temperature, having an improved storage stability, thereby avoiding the problem of pre-gelation in the extruder, and giving a coating which had a smooth coating appearance (reasons on pages 6 and 7, No. V of the decision under appeal).

(9) In the Opposition Division's opinion, this problem was solved by the subject-matter claimed, as shown by experimental evidence provided by the Patent Proprietor (section II(2), above), in which it had clearly been demonstrated that dry blending of the CA in component B) with component A), according to the patent in suit, gave a two-component powder system with improved storage stability and resistance to reaction in the extruder (the same chapter of the reasons, as above).

(10) However, no hint was found to be derivable from the available prior art to the adaptation of the teaching

of D7 for solving the above technical problem, let alone to a solution in accordance with the claims of the patent in suit. Thus, D1 would imply the use of curing agents active at elevated temperatures, eg at preferred curing temperatures of 175 to 185°C, and D8 would suggest the use of blocked isocyanates as curing agents or the use of ultraviolet-curable powders.

(11) The description had been adapted to the amended Main Request.

(12) Consequently, the patent in suit was found to comply with the requirements of the EPC 1973.

IV. On 16 December 2005, a Notice of Appeal was filed against this decision by the Opponent/Appellant. The prescribed fee was paid on the same date.

(1) In its Statement of Grounds of Appeal received on 8 February 2006 (SGA), the Appellant again raised an objection of lack of inventive step based on D1 and

D9: US-A-4 611 036,

which had been mentioned in the summons to the above oral proceedings before the Opposition Division and which disclosed a list of curing agents known to be active at room temperature, ie at temperatures of less than 93°C.

(2) In particular, the Appellant referred to the term "comprising" in Claim 1, which would, according to normal practice, suggest that, in addition to the actually specified constituents, other constituents might also be present, contrary to the finding in the decision under appeal that component B) would actually be free of any epoxy resin (section III(3), above).

Furthermore, it could be understood from the wording of feature B) in Claim 12 that another portion of epoxy resin could be present.

(3) When, however, the presence of any epoxy resin in component B) could not be excluded, Claim 1 should be revoked due to lack of inventive step, because the only difference between the composition of Claim 1 and the two-component powder systems used in D1 would then be the low temperature allegedly used for the curing according to the patent in suit, which had not, however, actually been the case in any one of the present examples. The curing temperature as defined in the claim would also cover higher temperatures up to but excluding the decomposition temperature which was far over 150°C up to 200°C (SGA: item 3.1).

(4) Document D7 would disclose the use of EPON Curing Agent® P-101 in epoxy resin powder compositions for temperature sensitive substrates at low temperatures, eg 121°C as mentioned on its page 2, left hand column, first paragraph. Moreover, this CA could be combined with specific EPON resins at levels of 2 phr or it could be blended with dicyandiamide to function as an accelerator. It could be derived from D7 that, by addition of 1 to 2 phr of dicyandiamide, the storage stability at temperatures of from 75 to 80°F (23 to 25°C) and the gel times of powder coating containing EPO Curing Agent® P-101 could be improved.

(5) Furthermore, the Appellant pointed out that no reference to low curing temperature could be found in Claims 10 to 16 relating to the method of coating wood by using the coating powder according to any one of the preceding claims. The use of higher temperatures up to

the decomposition temperature of the blend in the claimed method would certainly be obvious to a person skilled in the art over D1, the method of which would differ from the claimed method only in respect of the absence of curing at low temperature or the application of coating on heat sensitive articles.

(6) But even claims directed to a method for coating wood and being limited to a range of from 82 to 120°C or even 82 to 93°C as specified in the ***application*** would still be obvious to a person skilled in the art, due to the teachings of D1 and D9, the latter document disclosing a list of curing agents which had been known to be active at room temperature.

V. These arguments of the Appellant were disputed by the Respondent in its letter dated 4 December 2006.

(1) In particular, the Respondent supported the finding in the decision under appeal that D7 was the closest state of the art and argued along the same lines, in particular by pointing out why, in its opinion, D1 was not the closest piece of prior art. Thus, with regard to the technical problem to be solved (section III(8), above), the skilled person would not have considered D1, which was not concerned with coating heat-sensitive substrates and in which curing took place at 180°C.

(2) The Respondent conceded that D7 raised the question of storage stability and disclosed powder coating compositions for application at low temperatures. However, the document would not have addressed the problem of curing during extrusion. Nor would it suggest to extrude the epoxy resin with a small amount of CA and thereafter to blend a powder of the extruded resin with additional CA.

When the subject-matter of the product claims was found novel and inventive, this finding should also be valid for the claimed method.

As regards D9 referred to by the Appellant, the Respondent put emphasis on the argument of not having claimed curing agents active below 93°C, in themselves, as being novel, and it conceded that the examples of the patent in suit made use of commercially available curing agents. "What does not however emerge from any of the prior art documents is the idea of incorporating in two separate amounts the curing agent for a single amount of epoxy resin, as specified in claim 1." (No. 5.3 of the letter).

VI. In a further letter dated 26 January 2007, the Appellant argued that the interpretation of the term "comprising" by the Opposition Division and the Respondent, would have been different from the one used in a number of Board decisions and in the Guidelines C-III, 4.13, according to which it should have been interpreted broadly, ie as "to include" or "to comprehend". Therefore, appropriate questions should be addressed to the Enlarged Board of Appeal according to Article 112(1)(a) EPC in case of doubt in the correct interpretation of the expression "comprising".

VII. In a further letter dated 19 May 2008, the Respondent maintained its previous request that the appeal be dismissed and additionally filed two Auxiliary Requests, which did not, however, play any role for this decision.

VIII. Oral proceedings were held before the Board on 4 June 2008. In essence, both parties reiterated their previous arguments as submitted in writing. Therefore,

only new aspects or those points as again presented at the oral proceedings, which have been of particular importance for this decision, will be summarised herein below.

(1) As the first point, the question concerning the interpretation of Claim 1 was dealt with, in particular with regard to the term "comprising" in its first line. At the end of the discussion on this issue, the request for referral of (not yet formulated) questions to the Enlarged Board of Appeal (section VI, above) was withdrawn by the Appellant.

(2) In this discussion, the Appellant maintained its view that, due to the use of "comprising" in the first line of the claim, both components A) and B) of the claimed blend might contain further constituents. Thus, neither Claim 1, nor the description excluded the presence of an epoxy resin in component B), contrary to the finding in the decision under appeal. Nor was there any evidence which would have done so.

Nor would the use of the two terms "sufficient" and "insufficient" used in Claim 1 for distinguishing the subject-matter of the patent in suit from the prior art provide appropriate definitions of the amounts of the catalyst and CA, respectively. Thus, in the patent in suit ([page 3, lines 55 and 56]), the imidazole adduct could be present in the claimed powders at a level of from 0.1 to 8 phr of the extruded resin. This level would, in the Appellant's view, perfectly match with the amounts of EPON Curing Agent® P-101 in D7 (page 3, left column, paragraph "Effect of curing agent level", 1st sentence: 2, 3 or 4 phr) and would suffice to provide a full cure of the epoxy system (according to

[0022], first table, component (A) contained 2 phr of "Imidazole Adduct P-101"). It was not in dispute between the parties that the EPON Curing Agent® P-101 could act as a catalyst at low concentrations or as a CA at higher levels.

Furthermore, the Appellant criticised that the patent in suit did not provide anywhere any description of the extrusion conditions to be used, whereas in D7 these conditions, namely the temperatures of the extruder screw and of the extruder barrel, were given.

(3) Whilst conceding that component B) might contain further constituents such as pigments or fillers, the Respondent put emphasis on the exact wording in Claim 1, according to which in component A) the catalyst and/or CA could only be present at a level insufficient to substantially cure the epoxy resin contained in this component and which wording further required that the remainder of the curing system necessary for a full cure of the epoxy resin was provided by component B) as a "separate amount of the ... curing agent ... sufficient to complete the cure". The claim could only be construed to mean that component B) essentially consisted of the CA. Any other distribution of these components would go against the whole purpose of the claimed blend, ie the separation of the self-curing epoxy resin and the CA in order to prevent a premature curing of the self-curing resin in the homogenising extrusion of component A).

(4) With regard to the technical problem underlying the patent in suit, the Appellant started from D8, as referred to in [0003], according to which the curing of a coating on wood, ie a heat sensitive substrate, was

to take place at below 93°C. This could however be achieved, according to the Appellant, by using a low-temperature CA (as listed in D9). Moreover, the method of the patent in suit was not limited to such a low temperature, but allowed temperatures of up to just below the decomposition temperature of the coating composition, and in its [examples], temperatures of up to 149°C were used. Thus, [Table 3] would show that temperatures of from 116 to 143°C were used in reality.

(5) According to the Appellant, D7 described *inter alia* epoxy powder resin coating compositions, which could be cured at temperatures as low as 121°C. The epoxy resin, the CA/catalyst could, in D7, be the same as in the patent in suit, even the amount of the CA could be the same (cf. sections IV(4) and VIII(2), above). Moreover, D7 taught that the storage stability of its compositions could further be improved by adding dicyandiamide, and the epoxy resin mentioned in the footnote to the formulation recipe on its page 3 was similar to the one used in the additional experimental report of the Respondent (section II(2), above). In summary, the composition of D7 would correspond to component A) of Claim 1, which was then dry-blended with component B).

The only difference between the patent in suit and D7 was seen by the Appellant in that D7 did not involve the blending of two powders. Such a dry blending was, in the Appellant's view, however common practice as demonstrated by D1.

(6) Moreover, with regard to the identity of the CA/catalyst in the patent in suit and D7 (EPON Curing Agent® P-101) used in amounts and at temperatures

sufficient to achieve the full cure of the epoxy resin and to the fact that no extrusion conditions applied in the extrusion of component A) were provided in the patent in suit, the Appellant concluded that the composition as claimed would not solve the storage problem of the patent in suit.

Hence, the patent in suit would provide only an alternative coating composition which was obvious with regard to D7 and D1.

(7) The Respondent also started its arguments from the technical problem as presented in [0003], but pointed out that there had been a real danger of premature crosslinking of the self-curing epoxy resin during the extrusion or storage. In the present case, this danger was acute as regards the aim of coating heat-sensitive substrates such as wood with the epoxy coating powder, as set out in D8 (requiring crosslinking at below 93°C). Therefore, the problems of substantial curing of the epoxy resin in the mixing extruder and, at the same time, of blocking of powder derived from the extruded mixture during its storage had to be remedied.

(8) With regard to these problems and requirements, two questions arose, the first as to the amount of CA necessary for achieving the full cure of the coating on the substrate and the second as to how the premature curing during the preparation of the coating powder could be prevented.

(9) The solution for the above problems was found, according to the Respondent, in the splitting of the total amount of the CA necessary for the final cure, in the addition of only part of this amount to the epoxy resin subjected to the extrusion and in dry-blending

the remainder of the CA as a separate powder component to the powder prepared from the above extrudate.

According to the Respondent, such a two-component dry-blend powder composition had never been contemplated in any of the cited documents.

In D1, two separate fast and slow curing systems contained epoxy resin and sufficient CA and, at least in the fast curing system, a catalyst to cure the respective system. D1 did not deal with curing coatings on heat sensitive substrates at low temperatures.

In the Respondent's view, D7 addressed neither the same problem nor the same solution. Although it referred to one of the preferred catalysts/curing agents usable in the invention according to the patent in suit, it required higher temperatures (at least 121°C) for the curing at those amounts of 2, 3 or 4 phr (section VIII(2), above). Moreover, D7 never referred to the dry blending of two components as defined in Claim 1. By contrast, in [Example 1], curing took place at 107°C and no pre-cure had been observed and, furthermore, it had been shown in the [examples] and the additional experimental report (section II(2), above) that improved results over prior products had been achieved with regard to the storage stability of the coating powder and its low temperature curing. Only D8 had considered the technical problems to which the invention according to the patent in suit provided a solution, the document did not, however, point to this solution.

(10) Since no further comments were intended by the parties to Claim 1 or any one of the further claims, the debate was closed on the Main Request and the oral

proceedings was interrupted for the deliberation of the Board on this request.

IX. The requests of the parties at this moment were as follows:

The Appellant requested that the decision under appeal be set aside and that the patent in suit be revoked.

The Respondent requested that the appeal be dismissed or, in the alternative, that the decision under appeal be set aside and that the patent be maintained on the basis of the 1st or the 2nd Auxiliary Request, both filed with letter dated 19 May 2008.

Reasons for the Decision

1. The appeal is admissible.

Main Request

2. In the interlocutory decision under appeal, the amendments in the claims were deemed allowable under Articles 123(2) and 123(3) EPC 1973 (section III(2), above). No objection was raised by the Appellant in this respect during the appeal proceedings, nor does the Board see any reason to do so. It follows that the claims according to the Main Request (section II(3), above) comply with Articles 123(2) and 123(3) EPC.

Interpretation of Claim 1 of the Main Request

3. As apparent from the Facts and Submissions, above, the Appellant has based its objections under Article 100(a) EPC 1973/EPC on a broad interpretation of Claim 1. It argued in view of the use of the word "comprising" in

line 1 of the claim (cf. section I, above), that the composition of each component might contain further constituents (section IV(2), above). Thus, according to this interpretation of the claim, component B) could include additional epoxy resin.

Whilst it is true that the use of "comprising" in Claim 1 does not exclude the presence of further constituents and that, as conceded by the Respondent, and as shown by the description of the patent in suit, further constituents not ***expressis verbis*** mentioned in Claim 1 may be included in the claimed composition (cf. [0014], [0015] and the [examples]), the Board cannot accept the Appellant's view for the following reasons:

3.1 Claim 1 of the Main Request (cf. section II(3) in conjunction with section I, above) defines the claimed coating powder blend as comprising two components A) and B), "... both being in powder form".

3.1.1 According to its definition in the claim, component A) is required to be an extruded mixture composed of a self-curing epoxy resin and (i) a catalyst (the epoxy adduct of an imidazole of formula I) and/or (ii) a low temperature CA, active at 93°C (200°F), whereby these latter two constituents (i) and/or (ii) are comprised "in an amount insufficient to cause substantial curing of the resin during extrusion". In other words, their presence must not be such, that the self-curing epoxy resin can undergo substantial curing during the extrusion.

3.1.2 Furthermore, according to the claim, the coating powder blend comprises as the second component B) "a separate amount of the same or a different low temperature curing agent, ..., sufficient to complete the cure". In

other words, component B), blended with the extruded mixture A), serves the purpose of redressing the deficit in CA in component A), so that the powder blend can fully cure when applied to the substrate.

3.1.3 The preparation of the claimed two-component powder blend is explained in more detail in [0005]. According to this passage, the epoxy resin is first extruded with a small amount of catalyst or with a low level of low temperature CA and then ground and classified and, "Additional amounts of the low temperature curing agent in powder form are then blended with the powdered extrudate to raise the level of curing agent while avoiding the pre-gelation problem."

Any interpretation, that the quoted sentence would encompass mixtures of the CA and additional epoxy resin, completely lacks any basis in the specification and can only be considered as being the result of a wilful interpretation of the patent in suit in view of cited prior art (eg D7), because any presence of additional epoxy resin in component B), as argued by the Appellant, would directly go against the above ***expressis verbis*** teaching that, by the addition of ***additional amounts of the CA***, its level is to be raised so to assure that complete cure will be reached as required by the wording of Claim 1.

3.2 Instead, these definitions and explanations in the patent in suit leave, in the Board's view and in compliance with the existing case law, no room for an additional epoxy resin or an additional curable epoxy resin/CA powder coating composition in component B) of Claim 1.

Moreover, this view is additionally supported by the [examples] and, last not least, by the wording of Claim 12 (section II(3), above) describing the coating of wood with the above powder blend (ie according to Claim 1 or one of the claims appendant thereto). Contrary to the Appellant's argument in section (2), above, Claim 12 refers in its two process steps A) and B) to "a portion of the epoxy resin" and "another portion of the epoxy resin", respectively (emphasis added by the Board).

3.3 Nor are these findings, in the Board's view, invalidated by the further arguments mentioned in section VIII(2), above, referring to the terms "sufficient" and "insufficient" as used in Claim 1, nor by reference to some overlap between the amounts of imidazole adduct catalyst mentioned in [0011] ([page 3, lines 54 to 56]) and those of the CA "EPON Curing Agent® P-101" disclosed in D7 (page 3, paragraph "Effect of Curing Agent"). These arguments rather confirm the Board's view about the interpretation in the second paragraph of section 3.1.3, above.

Whilst it might be true that the amounts of the specific imidazole adduct described in D7 might be sufficient under the process conditions disclosed therein to lead to a complete cure of the epoxy resin, the patent in suit is not, however, limited to this specific compound and, consequently, the amount of the imidazole product and/or CA in component A) is defined in functional terms (cf. sections 3.1.1 to 3.1.3, above), rather than in terms of a numerical range for each conceivable individual compound. Furthermore, the [examples] and the Respondent's additional experimental report (section II(2), above) convincingly demonstrate

that the desired results (an extruded mixture of component A) which could be pulverised) could be obtained despite the doubts of the Appellant concerning the amounts of the imidazole adduct used and the extruding conditions.

The state of the art

4. The patent in suit relates to epoxy powder coating blends. Such compositions are known from D1, D7, D8 and D9.

4.1 Document D1 as specifically referred to in the SGA (section IV(3), above) discloses a powder coating composition comprising (A) one part by weight of a slow curing powder composition and (B) 0.5 to 5 parts by weight of a fast curing powder composition, prepared separately by blending the ingredients in a heated Z-blade mixer, on hot rolls or in an extruder (D1: Claim 1; column 4, lines 10 to 21; column 6, lines 21 to 54). Component (A) comprises a heat curable thermosetting resin, a latent CA and optionally a curing accelerator. Component (B) differs from component (A) in that the presence of the curing accelerator (catalyst) is mandatory and that the catalyst is present in an amount causing component (B) to cure faster than component (A) (D1: column 4, lines 7 to 10). The ratio of the latent CA to the preferred epoxy resin is essentially the same in both powder components (A) and (B) (D1: column 4, lines 24 and 25 in conjunction with column 5, lines 16 to 21).

These compositions of D1 give, upon curing, coatings with a matt finish. This effect is explained in D1 to be caused by (i) the slow curing component forming - before it is cured - a continuous phase when coated and

melted on the substrate and (ii) the fast curing component forming a dispersed phase, because "it cures so rapidly that diffusion into the continuous phase is blocked" (column 2, lines 31 to 40).

The curing (stoving) of the composition (comprising a heat curable thermosetting resin; column 4, lines 11, 13 and 14) is carried out by heating the coated article to about 120 to 200°C for 10 min to an hour, or until being cured (column 6, lines 70 to 72).

As thermosetting resins, acrylic resins and alkyd resins and preferably epoxy resins can be used, which are solid at ambient temperature and melt at about 60°C (D1: column 4, lines 22 to 26). For the preferred epoxy based powder compositions, D1 teaches to heat the coated articles to about 175 to 185°C for about 10 to 20 min (column 6, lines 73 to 75). In the examples, epoxy resin compositions were cured at 180°C.

No reference is made in D1 to the coating of heat-sensitive substrates, and the only substrates referred to are articles with metal surfaces (column 7, lines 12/13), such as cold rolled steel panels in its examples.

4.2 The technical Bulletin D7 relates to EPON Curing Agent® P-101 which is characterised as a "versatile, chemical stable, low bake or ultra-rapid curing epoxy powder coating converter", which "is a free flowing pulverized amine adduct especially designed to cure epoxy resin powder coatings at temperatures down to 250°C (121°C)" (page 2, first two sentences). The choice of the epoxy resin has a significant influence on the flow properties and the appearance of the powder coating, especially for coatings cured below 300°F (149°C). The

EPON Curing Agent® P-101 can be used in combination with dicyandiamide in order to adjust cure rate, reduce discolouration and improve package stability (page 2, right column, first two paragraphs). A number of hints are then given for the storage of compositions of this EPON Curing Agent® P-101 material in combination with particular EPON resins and optionally with dicyandiamide (page 2, right column, paragraphs 3 to 5).

On page 3, mention is made of the full cure of fully pigmented systems prepared with 2, 3 or 4 phr of the EPON Curing Agent® P-101 and cured in "15 or more min at 250°F or greater temperature" (ie ≥121°C). However, no cure response was found at 1 phr (left column, first paragraph with the heading "Effect of curing agent level").

According to the right column of page 3, the powder for the low temperature curing study was prepared by pre-blending all ingredients in a Welex device for 1 min at 1000 min^{-1} and 1 min at 2400 min^{-1}, followed by extrusion, chill-rolling, cooling, crushing and Wiley milling. White pigmented coatings of "EPON® Resin 2002/ EPON Curing Agent® P-101, 100/3 phr" were cured at low temperature. The results of the cure were depicted in curve diagram in Fig. 1. They were qualified as being satisfactory when the curing took place in temperature/ oven time conditions above a limit given by the curve ranging from about 250°F/about 30 min and about 275°F/14 min to about 300°F/about 5 min (121 to 149°C).

The preparation of a two-component dry-blended powder coating composition as defined in Claim 1 has never been contemplated in D7.

4.3 As acknowledged by both parties (sections VIII(4) and VIII(7), above), D8 addresses the technical problems concerning powder coating of heat-sensitive substrates such as wood with epoxy coating powder (cf. [0003]; *page 1, lines 5 to 8*; *page 2, lines 1 to 7 and 24/25*; *page 3, lines 16/17*). Apart from the problems directly related to the substrate, eg its humidity, it was pointed out in D8 that the curing temperature of the coating must be below about 200°F, which was, however, characterised as becoming "next to impossible, because the resin must have a melt and flow temperature at least 10 to 20 degrees lower than that. A resin with a softening temperature that low tends to block or sinter during normal storage. To cure in a reasonable length of time at such a low temperature, the curing agent must be quite reactive, which leads to difficulties during the extrusion operation." (200°F = 93°C; D8, page 55, middle column, first paragraph).

The solutions to these problems offered in D8 were to use blocked isocyanates which become unblocked and active, when heated, or to develop ultra-violet-curable powders. However, with regard to the first of these two options, the blocked isocyanates, D8 clearly states that no such compounds would be available which unblock at those low temperatures required for coating wood. As regards the other option, D8 refers to problems and limitations inherent to UV-curable systems in general.

4.4 The coating compositions of D9 were prepared either in solution (as exemplified in Referential Examples 1 to 15 and Examples 1 to 30) or as powder paints by mixing all the ingredients together and thereafter coarsely pulverizing, kneading, finely pulverizing and classifying in customary manner as exemplified in

Referential Examples 16 to 18 and Examples 31 to 33 (see, in particular, column 14, lines 21 to 37).

In column 5, a number of curing agents of different kinds (monomeric or polymeric) are listed, including dicyandiamide.

However, a two-component system was never considered in the document.

5. *Novelty*

In view of the findings in sections 3 to 3.1.3 and 4.1, above, the novelty objection with respect to D1 as initially raised in the Notice of Opposition is deemed unfounded, as already held in the decision under appeal (sections III(3) and III(4), above). In fact, this objection was no longer maintained by the Appellant in the appeal phase.

Problem and solution

6. As already indicated in section 4, above, the patent in suit relates to epoxy powder coating blends, more particularly to thermally curable two-component epoxy powder coating blends for thermo-sensitive substrates such as wood.

6.1 According to the [examples] and the results in the additional experimental report (section II(2), above), the problems mentioned in D8 (section 4.3, above) can be overcome by a composition as defined in Claim 1 (cf. section II(3) in conjunction with section I, all as above).

Thus, reference can be made to [0023], wherein it has been shown that compositions according to Claim 1 could

be cured at a temperature even as low as 107°C for 10 min to coatings having improved properties in comparison with comparative and control examples.

Likewise, improved results were also shown in further [examples] and in the experimental data provided with the additional experimental report mentioned above. In particular, the latter experiments ("**Ex 5**" and "**Ex 6**" in comparison with "**Ex 3**" and "**Ex 4**", respectively) demonstrate that, with only 0.1 phr or with 8 phr of imidazole epoxy adduct EPON Curing Agent® P-101 in component A), high MEK solvent resistance and good surface quality of the resulting coatings in combination with improvements as regards the storage stability, in terms of the gel time and the hot plate melt flow stabilities, could be achieved with the two-component compositions as claimed in comparison with the one-component comparative compositions outside the claims.

6.2 In view of the prior art cited in these proceedings, the question arises of whether D7 or D8 is to be considered as the closest state of the art.

6.2.1 Whilst having, in its SGA, regarded D1 as the closest piece of prior art which had the most features in common with the patent in suit, the Appellant argued at the oral proceedings only on the basis of a combination of (i) D8 and D9 and (ii) D7 and D1. The Respondent acknowledged that D7 dealt with coating powders for low temperature curing (ie at ≥121°C) and the problematic of their storage stability as already addressed in D8 (sections IV(3), V(2), VIII(4), VIII(5) and VIII(7), above).

6.2.2 The Board accepts the view of both parties (section 4.3, above), that the basic problems encountered by the skilled person when dealing with the powder coating of heat sensitive substrates, viz. the need of low temperature curing and the storage problem of the coating powder, are known from D8 (section 4.3, above), and concurs with the Respondent's view that only D7 considered these problems as well (section 6.2.1, above).

6.2.3 Consequently, the problem to be solved by the patent in suit with regard to either document (D7 or D8) can be seen in the provision of an epoxy resin coating powder blend which can be cured at temperatures sufficiently low to be suitable for the coating of heat sensitive substrates, eg wood, which, nevertheless, shows an improved storage stability and which provides smooth surface coatings.

6.2.4 For the reasons given in section 6.1, above, the Board is satisfied that the relevant technical problem (section 6.2.3, above) was indeed solved by blends as defined in Claim 1.

7. *Inventive step*

It remains to be decided whether the claimed solution of the above relevant technical problem derives in an obvious way from the cited documents.

7.1 As shown in section 4.2, above, the low temperature curable powder coating composition described in D7 is a powder composition homogeneous in itself which has been obtained by mixing all its ingredients together (page 3, right column, "Powder manufacture"). It does not give the slightest hint to prepare its low temperature

curable powder composition in a different way. As presented in the "Low temperature curing study" of D7 including its Figure 1, the curing requires certain combinations of minimum curing time at given minimum temperatures ("cured over a temperature range of 250°F to 300°F and at an oven time of 5 to 30 minutes", page 3, right column, lines 2 and 3), in order to provide "satisfactory cure" (page 4, below Figure 1). In comparison therewith, [Example 3] demonstrates that the patent in suit provides compositions requiring less stringent curing conditions (107°C/225°F for 10 min). Nor are any data given in D7 concerning the storage stability of the composition used in the low temperature curing study.

Consequently, this document itself does not assist the person skilled in the art to solve the relevant technical problem (section 6.2.3, above), let alone to solve this problem by providing a two-component blend as defined in Claim 1 (cf. section II(3) in conjunction with section I, both as above).

7.2 Whilst acknowledging that D7 did not involve the blending of two powders, the Appellant argued that such a dry blending was common practice as demonstrated by D1 (section VIII(5), above).

This argument cannot, however, prevail, because D1 never contemplated to divide the epoxy resin/CA/ catalyst powder coating system in two components, one component of which (in powder form) contained the self-curing epoxy resin and only an amount of CA and/or catalyst insufficient to cause substantial curing of the resin and the other component of which (also in powder form) provided the residual CA to complete the

cure of the resin. Rather D1 disclosed a two-component system containing two thermosetting resin powder coating compositions having the same or essentially the same resin/CA ratio (D1: column 5, lines 16 to 21). These compositions admixed thereafter with one another differ only in their content of curing accelerator, so that one of them cures faster than the other (section 4.1, above).

Therefore D1 cannot, in the Board's view, provide any hint how to solve the above relevant problem either. The arguments of the Appellant to modify the teaching of D7 by that of D1 in a way so as to arrive at something within the ambit of Claim 1 rather indicate that they are based on inadmissible hindsight.

7.3 This finding is also valid for D9. As set out in section 4.4, above, this document relates to curable epoxy resin compositions either in the form of solutions or in the form of powders, all of which contained all their respective ingredients in one homogeneous mixture. The relevant technical problem (section 6.2.3, above) was not addressed at all in this document. Nor did it contain the slightest hint to the solution according to the subject-matter of Claim 1 of the patent in suit.

7.4 Moreover, the Appellant's other argument, based on D8 as the closest state of the art, that the teaching of that document would easily be modified in the knowledge of D9 (section VIII(4), above) is not convincing at all, because D8 (published in April 1996) was written nearly a decade after the publication of D9 on 9 September 1986. Furthermore, as indicated in section 7.3, above, D9 does not provide any teaching to solve the relevant

technical problem, let alone any suggestion to do so by means of a two-component coating powder blend.

7.5 Consequently, the arguments of the Appellant cannot prevail, and the Board has come to the conclusion that the subject-matter of Claim 1 is, therefore, based on an inventive step.

8. The same conclusion is also valid for the subject-matter of dependent Claims 2 to 9, to the subject-matter of Claims 10 to 16, which relate to a method for coating wood by means of the above powder blend of Claim 1, and to the article of Claim 17 coated with the cured powder blend of Claim 1.

9. For these reasons, the Main Request of the Respondent is successful.

Auxiliary Requests

10. Since the Main Request of the Respondent was successful, there was no need to consider its further requests.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

E. Görgmaier C. Idez