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Bezeichnung der Erfindung: Dual-layer coating containing metallic-flake pigment and coated article
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : C09D 5/10

ENTSCHEIDUNG / DECISION

vom / of / du 28 March 1990

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent / Titulaire du brevet : E.I. du Pont de Nemours and Company

Einsprechender / Opponent / Opposant : BASF Lacke & Farben AG
AKZO N.V.

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Articles 54 and 56

Schlagwort / Keyword / Mot clé : "Novelty (yes)"
"Inventive step - non obvious transposition"

Leitsatz / Headnote / Sommaire

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Case Number : T 204/87 - 3.3.2

D E C I S I O N
of the Technical Board of Appeal 3.3.2
of 28 March 1990

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Representative :

Decision under appeal : **Interlocutory decision of the Opposition Division of the European Patent Office dated 10 April 1987 concerning maintenance of European patent No. 0 036 016 in amended form.**

Composition of the Board :

Chairman : A. Nuss
Members : M. Eberhard
C. Holtz

Summary of Facts and Submissions

I. European patent No. 0 036 016 was granted on 2 May 1984 on the basis of twenty-two claims, pursuant to European patent application 80 901 911.0, filed on 1 August 1980 and claiming the priority of an earlier US application.

Independent Claims 1 and 14 of the patent as granted read as follows:

1. A substrate coated with an improved dual-layer high-solids enamel coating of the kind wherein the coating comprises

(A) a cured base layer produced from a composition having
(1) binder constituents consisting essentially of a first film-forming material and a crosslinker for the film-forming material wherein the film-forming material is selected from the group consisting of acrylic resins, polyester resins, and alkyd resins having a weight-average molecular weight of 500-10 000;
(2) an organic solvent for the binder constituents in an amount of no more than 100% by weight of the binder; and
(3) chromatic and metallic-flake pigments; and

(B) a cured transparent top layer, deposited on said base layer, produced from a composition having
(1) binder constituents consisting essentially of a second film-forming material and crosslinker for the film-forming material wherein the film-forming material is selected from the group consisting of acrylic resins, alkyd resins, and polyester resins having a weight-average molecular weight of 500-10 000; and

(2) an organic solvent for the binder constituents in an amount of no more than 100% by weight of the binder,

wherein the improvement is characterised in that the metallic-flake pigment is present in the base layer in an amount of 10-24% by weight, based on the weight of the binder constituents of the base layer, and the chromatic pigment is present in an amount sufficient with the amount of the metallic-flake pigment to give the dual-layer coating a flake orientation index of at least 40.

14. An improved coating composition of the kind having

(1) binder constituents consisting essentially of a film-forming material and a crosslinker for the film-forming material wherein the film-forming material is selected from the group consisting of acrylic resins, polyester resins, and alkyd resins having a weight-average molecular weight of 500-10 000;

(2) an organic solvent for the binder constituents in an amount of no more than 100% by weight of the binder; and

(3) chromatic and metallic flake pigments; wherein the improvement is characterised in that the metallic-flake pigment is present in the composition in an amount of 10-24% by weight, based on the weight of the binder constituents, and the chromatic pigment is present in an amount sufficient with the amount of the metallic-flake pigment to give a cured coating of this composition a flake orientation index of at least 40.

II. Notices of opposition were filed by Appellants I and II (Opponents I and II) on 1 February 1985 and 31 January 1985 respectively, both requesting revocation of the patent on the ground of lack of inventive step. Appellant II also objected to lack of novelty. The oppositions were supported by sixteen documents of which only the four following appeared to be relevant at the appeal stage:

(1) DE-A-2 818 100 corresponding to BE-A-866 209 (15)
(2) Kunstharz-Nachrichten, Hoechst, 33, Vol. 6, July 1974, pages 1-9
(3) US-A-4 076 766
(16) US-A-3 639 147.

III. By an interlocutory decision dated 10 April 1987, the Opposition Division maintained the patent in an amended form. Only the description was amended. According to this decision, a combination of the teachings of the citations would not lead the skilled person to the claimed subject-matter since the relationship between the amount of chromatic pigments and the amount of metallic-flake pigments and its effect on the metallic glamour of a coating is not mentioned in any document.

IV. Appellants I and II filed notices of appeal against this decision on 6 June 1987 and 11 June 1987 respectively, with payment of the prescribed fees. Statements of Grounds of Appeal were filed in due time.

In his statement and at the oral proceedings held on 28 March 1990, Appellant I relied upon a new document in connection with inventive step, namely (17) Harmon Colors, 1978, "For Automative and Industrial Finishes". He submitted that it was known from document (2) to improve

the metallic glamour of coatings of dual-layer metallic lacquers by increasing the content of the aluminium-flake pigment up to 25 wt%. Furthermore, the determination of the kind and the amount of an appropriate chromatic pigment in order to provide a coating with a desired colour and an optimum metallic glamour was part of the routine experimentation of the paint formulator as shown by documents (2) or (17). In the Appellant's view, the transposition of this usual practice to coating systems with higher solids contents did not involve an inventive step. He pointed out that once the amount of metallic flake pigment had been increased to improve the metallic glamour, it would be obvious to increase the amount of chromatic pigment in order to obtain the desired colour.

In his statement, Appellant I further raised a novelty objection against Claim 14 on the basis of two new documents, namely (18) US-A-4 131 571 and (19) US-A-3 558 564. However, he dropped this objection at the oral proceedings and did not rely any longer upon these documents.

Appellant II was duly summoned to oral proceedings but did not attend the proceedings, which thus took place in his absence in accordance with Rule 71(2) EPC. In his statement of grounds he considered document (15) (corresponding to (1)) as the most relevant citation and argued that the differences listed in the appealed decision did not involve an inventive step, since two of them were stated in the preamble of Claim 1 and the coatings obtained in the examples of (15) exhibit an excellent appearance and a uniform metallic effect without any disorientation of the aluminium flakes. He contended that citations (3), (2) and (16) also supported lack of inventive step. With regard to Claim 14, Appellant II considered document (3) as a complete anticipation thereof.

In further written submissions, he pointed out, by referring to documents (1) to (3), that in the absence of any indication of a prejudice against using the known higher concentrations of metal flakes in the known highly concentrated enamels, there could be no question of any surprising effect. He alleged that the statements on page 2 of the patent were without any basis and cited a new document, namely (20) US-A-3 087 829.

V. The Respondent stressed that, on the one hand, high-solids enamel coating systems were desirable from an environmental standpoint but that, on the other hand, it was known before the priority date that metallic flakes could not orient satisfactorily in high-solids systems in contrast to low-solids coating systems as a consequence of the lower shrinkage during solvent evaporation. Therefore, the skilled person could not expect that increased amounts of metallic-flake pigment in the high-solids coating systems would improve the flakes orientation.

At the oral proceedings, the Respondent submitted an amended Claim 14 in reply to the Board's question as to whether the claimed composition leads to a cured coating with the given flake orientation index (FOI) without top layer. Amended Claim 14 differs from the granted one in that the reference to "a cured coating of this composition" in connection with the FOI value has been replaced by "a cured dual-layer coating according to Claim 1".

VI. The Appellants requested that the decision under appeal be set aside and that the patent be revoked.

The Respondent requested that the patent be maintained on the basis of Claims 1 to 13 and 15 to 22 as granted and Claim 14 in the amended form as filed at the oral proceedings.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is, therefore, admissible.

2. **Amendments**

There are no objections under Article 123(2) and (3) to the amended Claim 14, since the reference to "a cured dual-layer coating according to Claim 1" having the desired FOI of at least 40 is supported by the application as originally filed (see page 4, lines 12-20 and original Claim 1) and, in addition, the amended claim manifestly does not broaden the scope of the granted Claim 14.

3. **Closest state of the art**

The patent in suit relates to a dual-layer high-solids enamel coating comprising a pigmented base layer and a transparent top layer, wherein the base layer includes binder constituents and both metallic-flake and chromatic pigments. "High-solids" enamel coatings according to the patent are defined as those produced from compositions having an amount of organic solvent for the binder constituents of no more than 100% by weight of the binder (see page 2, lines 21-30 and 55-58 of the patent in suit).

Appellant I contended that the enamel coating as described in the preamble of Claim 1 as granted is known and

represents the closest prior art. However, he has not submitted any evidence in support of his argument, whereas the Respondent has refuted this allegation.

Under these circumstances, coatings as defined in the preamble of Claim 1 cannot be considered as forming part of the state of the art (see decision T 219/83, Zeolites/BASF, OJ EPO 1986, 211).

According to the Respondent, high-solids enamel systems are desirable from an environmental standpoint on the one hand, but, on the other hand, it was well known before the priority date that the orientation of the metallic flakes is unsatisfactory in high-solids enamel coatings containing low amounts of flakes (i.e. the usual amount of about 0,5-2,5 wt% of the binder) so that the desired metallic glamour cannot be achieved. Similar statements can be found in the patent, page 2, lines 10-18 and 48-63 and Appellant I confirmed this description of the prior art at oral proceedings. Consequently, the Board has no reason to question what is accepted to be the ruling state of the art. In view of this and in the absence of more relevant documents, the Board considers these high-solids enamel systems including low amounts of metallic-flake pigment and exhibiting a poor metallic glamour as closest prior art.

4. **The problem and the solution**

In the light of this prior art, the problem underlying the disputed patent is thus seen in providing a dual-layer high-solids metallic colour coating, which exhibits an improved metallic glamour approaching that obtained with low-solids coating compositions.

According to Claim 1 as granted, this problem is essentially solved by a dual-layer high-solids enamel coating in which (a) the base layer contains 10-24% by weight of metallic-flake pigment based on the weight of the binder constituents and (b) the chromatic pigment is present in an amount sufficient to give with the amount of metallic-flake pigment a dual-layer coating having the desired metallic glamour, i.e. a flake orientation index (FOI) of at least 40.

In view of the new example filed on 3 October 1986 and amended as indicated in the Respondent's letter of 21 October 1986, the Board is satisfied that the technical problem is plausibly solved. The reported value of 44,4 for the FOI is higher than the desirable value of at least 40, which could not be achieved with the known high-solids enamel coatings and is moreover relatively close to the FOI of 50 obtained with commercial low-solids lacquers.

5. Novelty

The Board cannot follow the Appellant's contention that document (3) is a complete anticipation of Claim 14. It relates to compositions having a solids content of film-forming constituents of 10-70 wt%, preferably 10-40 wt%. These compositions may be either clear or pigmented. If pigmented, they can contain a pigment/binder ratio of up to 50/100 (cf. column 2, lines 17-22), the pigment being chosen from the list mentioned at column 5, lines 46-54, which comprises metallic flakes among a plurality of other pigments. In addition to this, the pigmented compositions exemplified in (3) all have a total solids content of no more than 45 wt%, for example 35 wt% or even less in the case of aluminium flakes (see example 3). It is thus not implicit from this teaching that the compositions having the highest solids contents of film-forming constituents contain metallic flakes as pigment. Therefore,

document (3) does not expressly and unambiguously disclose coating compositions with a solvent/binder weight ratio of no more than 100/100 containing either a metallic-flake pigment or both metallic-flake and chromatic pigments.

None of the other cited citations describes high-solids enamel compositions containing 10-24 wt% metallic-flake pigment.

Thus, the compositions of Claim 14 and the dual-layer high-solids enamel coating as claimed in Claim 1 are novel.

6. **Inventive step**

It still remains to be examined whether the claimed subject-matter involves an inventive step with regard to the teaching of the four documents mentioned under point II above.

6.1 Document (2) discloses acryl resin lacquers for dual-layer metallic coatings containing a metallic-flake pigment, such as aluminium flakes, in the base layer. The three exemplified base coat compositions reported in this document (cf. page 6, table 2) are low-solids compositions having a solvent to binder ratio of more than 300/100 and an Al-flake content between about 20 and 24 wt% of the binder as shown in the Respondent's letter dated 3 October 1986. They do not contain any chromatic pigment. Document (2) teaches that one-layer silver coatings including about 3.5% aluminium flakes (with respect to the binder) exhibit optimal gloss and hiding power while in the case of dual-layer coatings, an increase in the Al-flake content of the base layer up to 25% is possible and leads to considerable advantages as regards hiding power and metal effect, i.e. the metallic glamour (cf. page 4, right-hand column, second paragraph).

The question to be answered is, therefore, whether the skilled person seeking a solution to the problem of improving the metallic glamour of dual-layer high-solids enamel coatings would have been prompted to transpose this teaching about the low-solids coating systems to the high-solids one, or in other words, whether he would have tried to increase the metallic-flake content thereof in expectation of an improvement of the metallic glamour.

According to the patent in suit, it was well known before the priority date that the orientation of most of the metallic flakes practically parallel to the substrate leads to high-quality metallic glamour and is largely produced by shrinkage of the coating during solvent evaporation. As stressed by the Respondent, it was further well known that the shrinkage of high-solids enamel coatings containing the usual low amount of metallic flakes is much more lower than that of low-solids coatings so that the leveling action on the metallic flakes during solvent evaporation is diminished and the flakes cannot orient satisfactorily (cf. patent, page 2, lines 10-18 and 48-63). As Appellant I confirmed this as forming part of the prior art before the priority date, the unsubstantiated adversed opinion of Appellant II is not credible and cannot, therefore, convince the Board.

Therefore, the person skilled in the art was aware of the fact that a marked increase in the solids content, in order to provide high-solids enamel compositions, unfavourably affects the flakes orientation in the coating partly because of the lower shrinkage thereof and thus impairs its metallic glamour. In the Board's opinion, the skilled person aware of this would not expect that an increase in the metallic-flake content of high-solids

enamel coatings could improve their metallic glamour. Therefore, he would not be encouraged in view of the teaching of (2) to carry out experimentation in this direction.

6.2 This conclusion remains also unchanged when considering the teaching of document (1) which corresponds to document (15). This document discloses base coat compositions containing both metallic-flake and chromatic pigments, in which the metallic-flake pigment is present in an amount of 5-20 wt% based on the total weight of acrylic film-forming polymer and insoluble polymer microparticles (cf. Claims 1, 3, 8, 19 and 20, examples 1 to 4). However, the Board could not find any statement in (1) showing that the pigmented base-layer compositions are high-solids enamel compositions as stated in the appealed decision and contended by Appellant II. In the four examples of document (1), the base layer is produced from compositions having a solvent to binder ratio higher than 500/100 and an aluminium-flakes content which indeed lies within the range claimed in the patent in suit, such compositions are, however, low-solids compositions.

This document teaches in particular that (i) a finish having an excellent appearance and a uniform metal effect with no trace of movement of the metallic flakes can be obtained without intermediate baking operation before application of the clear top-layer if the polymer of the base-layer includes insoluble polymer microparticles (see page 7, third paragraph; page 29, lines 4-13; example 1 and comparative example) and (ii) the presence of the polymer microparticles in the base layer improves the disposition (orientation) of the flakes during the application of the base layer and subsequent application of the top layer (cf. page 25, second paragraph). Therefore, although document (1) shows that dual-layer

low-solids coating systems containing a relatively high amount of metallic flakes exhibit a good metallic glamour, this result is mainly connected to the presence of the polymer microparticles in the base layer rather than to the high content of metallic flakes. Under these circumstances, and taking into account the prior art indicated above in 6.1, this document would not suggest either alone or combined with (2) that the solution to the present problem lies in increasing metallic-flake content of the known high-solids enamel coatings.

6.3 Document (16) relates to the production of a multilayer coating system by deposition of a transparent topcoat on a pigmented base coat before baking thereof (wet-on-wet process). Only examples 1 and 3 are directed to two-coat systems including a metallic-flake pigment and a chromatic pigment in the base coat. The resulting coatings exhibit an excellent gloss and either outstanding esthetic properties or excellent polychromatic properties with uniformity of the aluminium particle orientation. As shown in the table enclosed with the Respondent's letter of 3 October 1986, the Al-flake content of such base layer is respectively of about 26 wt% and 3-4 wt% of the binder constituents, however, both compositions are low-solids coating compositions. Furthermore, in the composition with the highest Al-flakes content, the solvent concentration is exceptionally high (solvent/binder higher than 1400/100 by weight). Although the control of metallic-flakes dispersion and orientation in the film is mentioned as an advantage in column 6, lines 37-61, there is no indication in this passage or in examples 1 and 3 which would lead the skilled person to the conclusion that a high metallic-flakes content may improve the metallic glamour of high-solids enamel coatings.

6.4 The purpose of document (3) (already analysed above in connection with novelty) is to provide acrylic enamels having excellent low temperature flexibility, adhesion to primers and substrates, gasoline resistance and gloss (see column 1, lines 23-30, and examples). The problem of metallic glamour or orientation of the metallic flakes in the coating is not dealt with in this document. Furthermore, the composition of example 3, which leads to a uniform silver-grey metallic finish, contains about 3.9 wt% aluminium flakes (with respect to the weight of the binder), namely a relatively low amount, and its solids content is only 35 wt%. In the Board's view, this teaching would not be of any assistance to the skilled person faced with the problem of improving metallic glamour in the case of high-solids enamel coating systems.

6.5 Therefore, for the reasons given above, the Board considers that the incorporation of 10-24 wt% of metallic-flake pigment in dual-layer high-solids colour enamel coatings in order to improve their metallic glamour to a level approaching that obtained with low-solids coating compositions, is not obvious in the light of the cited prior art. Thus, the subject-matter of Claim 1 involves an inventive step and under these circumstances it is superfluous to examine whether the additional feature (b) of the proposed solution is obvious or not.

7. After examination of the late filed documents (17) to (20) of its own motion under Article 114(1) EPC, the Board has reached the conclusion that it would not arrive at a different decision if they were taken into account.

8. As the preceding reasons apply likewise to the high-solids enamel coating composition as claimed in Claim 14, this composition is also considered to involve an inventive step.

Claims 1 and 14 being allowable, the same applies to the dependent Claims 2 to 13 and 15 to 22 which merely represent preferred embodiments thereof and whose patentability is supported by that of the claims on which they depend.

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 to maintain the patent in an amended form on the basis of Claims 1-13 and 15-22 as granted and Claim 14 as amended in the course of oral proceedings with a description to be brought in conformity therewith.

3. The Respondent is requested to file an adapted description within a period of two months from notification of the written decision.

The Registrar: The Chairman:

M. Beer A. Nuss