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**Datasheet for the decision
of 23 May 2023**

Case Number: T 2458/19 - 3.3.06

Application Number: 10159208.7

Publication Number: 2239307

IPC: C09C1/64, C09D11/00,
C09D11/322, C09D11/326,
C09D17/00, B82Y30/00

Language of the proceedings: EN

Title of invention:

Water-resistant aluminum pigment, water-resistant aluminum pigment dispersion, aqueous ink composition containing the aforementioned, and method for producing water-resistant aluminum pigment dispersion

Patent Proprietor:

Seiko Epson Corporation

Opponent:

ECKART GmbH

Headword:

Aluminum pigment/EPSON

Relevant legal provisions:

EPC Art. 123(2), 83, 56

Keyword:

Amendments - allowable (yes)

Sufficiency of disclosure - undue burden (no) -
reproducibility (yes)

Inventive step - (yes) - non-obvious alternative

Decisions cited:

T 2170/14

Catchword:



Beschwerdekammern

Boards of Appeal

Chambres de recours

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Case Number: T 2458/19 - 3.3.06

D E C I S I O N
of Technical Board of Appeal 3.3.06
of 23 May 2023

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted on 8 July 2019 rejecting the opposition filed against European patent No. 2239307 pursuant to Article 101(2) EPC.**

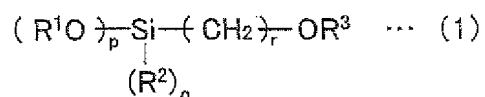
Composition of the Board:

Chairman J.-M. Schwaller
Members: S. Arrojo
J. Hoppe

Summary of Facts and Submissions

- I. The appeal was lodged by the opponent against the decision of the opposition division to reject the opposition against European patent No. 2 239 307.
- II. In its statement of grounds of appeal, the appellant requested to set aside the decision and to revoke the patent in its entirety, arguing that the claimed invention was insufficiently disclosed, that it extended beyond the content of the application as filed and that the granted claims were not inventive in view of the combination of any one of D1/D1E (JP2008201991/EN translation), D7/D7E (JP2001011357/EN translation) and D8/D8E (JP2003253182/EN translation) with the teachings of D4 (DE 10 2005 037 611 A1), D5 (DE 198 20 112 A1) or D6 (EP 1 619 222 A1).
- III. In its reply filed on 3 March 2020, the patent proprietor and respondent requested to dismiss the appeal and to maintain the patent as granted (main request) or, as an auxiliary measure, in amended form on the basis of one of auxiliary requests 1 to 4 filed therewith, wherein claim 1 of **auxiliary request 2** reads as follows:

"1. A water-resistant aluminum pigment comprising: a compound of general formula (1) described below, which is chemically bonded to particle surfaces of the aluminum pigment; and at least one selected from polyoxyethylene alkyl ether phosphate and salts thereof,



(wherein p represents an integer of 1 to 3, q represents an integer that satisfies the equation $p + q = 3$, r represents an integer of 2 to 10, R^1 and R^2 each independently represent an alkyl group having 1 to 4 carbon atoms, and R^3 represents an acrylic group, an acryloyl group, or a methacryloyl group)."

IV. In its preliminary opinion, the board indicated that claim 7 as granted and claim 6 of the first auxiliary request extended beyond the content of the application as filed but that the claims of auxiliary request 2 appeared to meet the requirements of the EPC.

V. At the oral proceedings, which took place on 23 May 2023, the proprietor withdrew the main and first auxiliary requests. The parties' final requests were then as follows:

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

The respondent requested that the patent be maintained in amended form on the basis of the claims according to auxiliary request 2, or as an auxiliary measure, of one of auxiliary requests 3 to 4, all requests as filed with its reply dated 3 March 2020.

Reasons for the Decision

1. Auxiliary request 2 - Article 123(2) EPC

The board has concluded that the requirements of Article 123(2) EPC are met for the following reasons:

1.1 Claim 1 at issue corresponds to claim 11 as filed with the following deletion as highlighted by the board:

" 11. A water-resistant aluminum pigment comprising: a ~~structure in which at least a~~ compound of general formula (1) described bellow, which is chemically bonded to ... "

- 1.2 The appellant argued that this claim extended beyond the content of the application as filed, because the wording of claim 11 as filed implied that the compound of formula (1) was part of a structure formed by the silane, which was differentiated from the polyoxyethylene alkyl ether phosphate. Since this requirement had been deleted, claim 1 at issue encompassed embodiments which extended beyond the scope of the application as filed.

It was namely apparent from the description as filed (see paras. [0018], [0104], [0105] and examples 1-3) that the silanes of formula (1) were intended to form a 3-D "structure" with a certain thickness, such as a film covering the surface of the aluminum particles. By contrast, in claim 1 at issue the compound of formula (1) was not part of any structure and its arrangement on the particle was not differentiated from that of the polyoxyethylene alkyl ether phosphate. The invention thus encompassed embodiments not covered by the application as filed, such as configurations in which the aminosilanes were bonded to the particles in an isolated form - i.e. without forming an identifiable separate structure - surrounded by the ether phosphate.

- 1.3 The board does not follow this argumentation, because the deletion of the concept "structure" is not considered to extend beyond the content of the application as filed. The term "structure" in claim 11 as filed encompasses both physical structures, i.e. 3-D shapes formed by multiple silanes bonded to one

another (as interpreted by the appellant) as well as chemical structures such as those formed by the silanes bonded to the surface of the aluminum pigment. Since there is no reason for a more specific interpretation, the wording of original claim 11 basically covers any physical and/or chemical form which could result from the defined chemical bonding between the compound of formula (1) and the aluminum pigment.

As pointed out by the appellant, the reference to a "structure" in the description as filed (see paras. [0018] and [0105]) concerns preferred embodiments in which the compound of formula (1) takes specific physical shapes such as that of a film covering the aluminum particles. However, in its generic form (as defined in claim 11 as filed), the term "structure" merely fulfills an auxiliary function which does not restrict the scope of protection in any meaningful way. More specifically, the term is considered to be broad enough to encompass any possible physical or chemical arrangement of the compound of formula (1), so its definition does not restrict the subject-matter but simply provides a basis for defining some preferred embodiments (e.g. those in which the compound is provided in the form of a film). In other words, the fact that the term "structure" is used to describe specific shapes in preferred embodiments of the description as filed does not imply that the generic term in the claim should be narrowly interpreted in the light of the description.

In view of the generic understanding of the term "structure", the deletion of the expression "*a structure in which at least*" is not considered to broaden or modify the subject-matter of claim 1 in any

meaningful way with respect to the subject-matter of claim 11 of the application as filed.

1.4 The subject-matter of claim 1 at issue is thus supported by claim 11 as filed, so auxiliary request 2 does not extend beyond the content of the application as filed.

2. Auxiliary request 2 - Sufficiency of disclosure

The board has concluded that the requirements of Article 83 EPC are met.

2.1 The appellant argued that the wording of claim 1 explicitly defined a compound of formula (1) (in its non-hydrolysed form) "*chemically bonded to the particle surfaces of the aluminum pigment*", which implied that the invention required the formation of any type of chemical bond between the compound of formula (1) and the aluminum particles. This chemical binding would however only be possible by means of hydrolysis reactions as described in paragraph [0029] of the patent, which implied that it was not the compound of formula (1) which was chemically bonded to the aluminum particle but rather its hydrolysed form. This issue could not be resolved by consulting the description, because the features of the claims should be given their broadest possible technical sense. A skilled person would therefore not be capable of reproducing the invention as defined in claim 1, because the compound of formula (1) could not be chemically bonded to the aluminum particles.

In a subsequent line of argumentation presented at the oral proceedings, the appellant contended that if the problem of sufficiency were to be resolved by

interpreting the meaning "chemically bonded" as a covalent bond formed by means of hydrolysis reactions, the invention would still be insufficiently disclosed because this would require avoiding all other possible chemical reactions between the compound of formula (1) and the particles, such as condensation reactions. Achieving this would require a research program in order to precisely adjust all the operating conditions in order to prevent the undesired reactions, which would represent an undue burden for the skilled person.

- 2.2 The board disagrees with the above arguments, because they are based on technically unreasonable interpretations of the feature "*a compound of general formula (1) ... is chemically bonded to particle surfaces of the aluminum pigment ...*" defined in claim 1.

A skilled person reading this feature would readily understand that the reference to a chemical bond implies that the compound of formula (1) reacts with the pigment, an interpretation which is confirmed by the indication in the patent (see paras. [0029] and [0066]) that "chemically bonded" is used to indicate that the substances react via hydrolysis. The appellant's interpretation - that it is the compound of formula (1) as such which should be bonded to the aluminum surface - would not be contemplated by a person skilled in the art, because it is technically unsound and goes against both the teachings of the patent and common general knowledge. In particular, as the appellant itself argued (point 2 of the grounds of appeal), the formation of a chemical bond between the compound of formula (1) (in the form presented in claim 1 at issue) and the pigment would be contrary to the laws of nature, and the skilled person would normally

disregard interpretations which, while formally covered by the claim, do not make technical sense (see e.g. T 2170/14, reason 1.3).

It is also not apparent for the board why the meaning of "chemically bonded" in claim 1 at issue should be narrowly interpreted in view of the description. As the appellant itself argued in its first submission, the features in the claims should be given their broadest possible technical sense, so there is no reason to conclude that claim 1 at issue is restricted to chemical bonds formed by hydrolysis. Furthermore, even if the claim was assumed to define chemical bonds formed by hydrolysis, this would not imply that other types of chemical bonds are excluded.

In summary, notwithstanding the fact that claim 1 defines that a compound of formula (1) reacts with the aluminium particles to form any type of chemical bond, the skilled person would recognise, in view of the description and common knowledge, that such chemical bonds mostly involve hydrolysis reactions (which does not mean that other reactions should somehow be avoided). The reproduction of the conditions to form chemical bonds between the alkoxysilane and aluminum particles would be trivial for a person skilled in the art, not only because the patent provides examples on how this can be achieved but also because such reactions are standard in the underlying technical field.

2.3 The board therefore concludes that the claimed invention is sufficiently disclosed.

3. Auxiliary request 2 - Inventive step

The board has concluded that the requirements of Article 56 EPC are met for the following reasons:

- 3.1 The invention relates to a water-resistant aluminum pigment, a dispersion and an aqueous ink containing said pigment. When aluminum pigments are dispersed in water they tend to react by generating hydrogen and whitening the particles due to the formation of alumina, thereby impairing its metallic luster (see par. [0005]). The invention proposes to prevent this undesired reactions by coating the aluminum pigment with a silicon-oxygen additive having the general formula (1), and by mixing the resulting pigment with an aqueous solution containing an alkyl ether phosphate dispersant.
- 3.2 Closest prior art
 - 3.2.1 The appellant cited documents D1/D1E, D7/D7E and D8/D8E as possible starting point for the inventive step argumentation.

D1/D1E discloses (see paras. [0001],[0002],[0003],[0006] and [0013]) an aqueous ink composition containing an aluminum metal pigment, wherein a phosphate ester compound such as polyoxyethylene alkyl ether phosphate is added to the composition to prevent the formation of hydrogen and the discoloration of the ink caused by the reaction of aluminum with water. According to par. [0038], the ink composition might include additional components.

D7/D7E (see paras. [0012],[0019]; abstract) refers to the problem of reduced gloss when aluminium pigments are dispersed in water. This document proposes solving the problem by treating aluminium pigments with

polyoxyethylene alkyl phenyl ether phosphate or salts thereof.

D8/D8E discloses an ink composition comprising an aluminum pigment and also intends to solve the problem of maintaining the metallic gloss over time (see par. [0001]). This problem is solved by combining the aluminum pigment with a phosphate ester surfactant such as alkyl phosphoric acid or polyoxyethylene alkyl ether phosphate or salts thereof (claims 1 and 2). The aqueous metal ink composition may further contain other additives (see par. [0035]).

- 3.2.2 The board considers that any one of these documents represents a suitable starting point for assessing inventive step, because each of them addresses the problem of preventing discoloration of aluminum metallic pigments in aqueous compositions and proposes to solve the problem by adding an alkyl ether phosphate surfactant.

For the sake of simplicity, the board will however use document D1/D1E as the closest prior art, but the three documents are considered to be substantially equivalent. The argumentation and conclusions are therefore the same when starting from D7/D7E or D8/D8E as the closest prior art.

- 3.2.3 The subject-matter of claim 1 differs from the disclosure in D1/D1E in that a compound of general formula (1) as described in claim 1 at issue is chemically bonded to the surface of the aluminum pigment.

- 3.3 Problem solved according to the patent

3.3.1 According to par. [0008] of the patent the object of the invention is to provide "a water-resistant aluminum pigment which prevents whitening and which has excellent water dispersibility and a metallic luster when the pigment is incorporated into an aqueous paint or an aqueous ink composition, and a water-resistant aluminum pigment dispersion".

3.3.2 The patent includes several examples (see paras. [0117]-[0176]) comparing aluminum pigment dispersions according to the invention (see examples 1-14) with others using a different surfactant (comparative example 1) or silane additives different from those covered by formula (1) in claim 1 (see comparative examples 2-6). In view of the results shown in tables 5 and 6 of the patent, the dispersions according to the invention appear to provide an improvement versus the comparative ones in terms of water resistance, dispersability and metallic luster.

3.4 Reformulation of the problem

3.4.1 The appellant argued that all the examples in the patent include the addition of an alkoxyalkylsilane on top of the silane of formula (1) and that, according to par. [0071] of the patent, the addition of this second silane was necessary to achieve the effect of preventing whitening of the pigment. Claim 1 at issue did however not define the presence of this second silane, which was only defined in dependent claim 2. The invention could therefore not be considered to provide the alleged technical effects, so the only problem solved was the provision of an alternative water-resistant aluminum pigment.

3.4.2 While the board considers that the tests in the patent appear to indicate that the compound of formula (1) provides some technical effects, it will be assumed for the sake of the argument - in the appellant's favour - that the only problem solved by the invention is the provision of an alternative water-resistant aluminum pigment. As explained in the next paragraph, even under this assumption the invention is considered to represent a non-obvious alternative.

3.5 Non-obviousness of the invention

3.5.1 In the discussion on obviousness, the appellant referred to the following documents:

D2 relates to pigment preparations for base coats in vehicle production lines (see page 1, lines 6-9). Before reaching the spray coating devices, these preparations are exposed to heavy shearing strains when flowing through the circulation lines, which can be detrimental for the resulting effect and color shade (see page 1, lines 10-16). In order to increase the shear stability and prevent the above cited problems, D2 proposes coating the pigments with a silicon-oxygen matrix. The preparation preferably comprises aluminum pigments (see page 2, line 29) and the silicon-oxygen matrix is formed by hydrolysable monosilanes such as vinyl trimethoxysilane, aminopropyl triethoxysilane, isocyanatopropyl triethoxysilane, 3-glycidyloxypropyl trimethoxysilane, 3-(meth)acryloxy-propyl trimethoxysilane, 3-(meth)acryloxypropyl triethoxysilane (see page 2 ,lines 19-22).

D4 describes metallic aluminum pigments and refers in particular (par. [0003]) to corrosion problems of these pigments in alkaline aqueous media and to the

associated detrimental effects on the optical properties. To solve this problem, D4 proposes to coat the particles with a hybrid inorganic/organic layer, which includes an inorganic oxide component covalently bonded to an organic oligomer and/or polymer via one or more organic network formers preferably comprising silanes selected from a list of alternatives (see par. [0046] and [0047]) including some compounds falling within the scope of formula (1) in claim 1 at issue.

D5 relates to metallic pigments for the automotive industry and in particular addresses the problem of ensuring good orientation of the metallic particles and good adhesion with the surrounding lacquer/solvent (see page 2, lines 31-48). To solve this problem, D5 proposes to use a silane such as (see example 1) 3-methacryloxypropyltrimethoxysilane, i.e. a compound falling within the scope of formula (1) in claim 1 at issue.

D6 discloses an aluminum pigment to be used in an aqueous paint or ink, and addresses the problem of improving dispersibility and stability of the pigment in the presence of water during storage (see par. [0007]). The proposed solution consists on coating each aluminum particle with a film composed of molybdenum oxide and/or molybdenum hydrate, and a silica coat comprising amorphous silica and/or a coat prepared from a silane coupling agent further covering said molybdenum coat (see claim 1). At least some of the silanes proposed in D6 (see the formula in par. [0029] and the list of silanes in par. [0067]) fall within the scope of claim 1 at issue.

3.5.2 The appellant argued that the solution proposed in claim 1 was obvious in view of document D1/D1E combined

with the teachings of either D2, D4, D5 or D6. In particular, D1/D1E explicitly proposed exposing the aluminum particles to a pretreatment step (see par. [0028]), which provided a springboard for considering surface treatments with other compounds. Documents D2, D4, D5 and D6 taught a surface treatment step of aluminum pigment with compounds of formula (1), and in particular D2 and D5 (specially the latter) proposed adding the silane compound for maintaining the optical properties of the pigment. Since the only problem solved by the invention was that of proposing an alternative pigment, the solution proposed in claim 1 at issue was obvious in view of any one of these documents.

3.5.3 The board first notes that when the object of an invention is simply that of providing an alternative (rather than addressing a specific technical problem), there is no need to identify incentives to contemplate options known from the relevant technical field. However, for the solution to be obvious, it is still necessary to conclude that it would be technically reasonable to combine the closest prior art with the relevant feature(s) from the other documents. This generally implies that the relevant teachings should be disclosed within a similar technical context and should be linked to functions which would be applicable to the invention in the closest prior art.

3.5.4 The board has concluded that when starting from D1/D1E as closest prior art, none of the disclosures cited by the appellant renders claim 1 obvious for the following reasons:

While document D1/D1E deals with aqueous composition in writing utensils (e.g. pens), document **D2** relates to

the treatment of vehicle painting compositions. The silane compound in D2 is intended to prevent alterations of the color shade caused by heavy shearing strains taking place when the composition is conveyed through a circuit of a vehicle coating production line (see page 1, lines 12-16). In view of the differences in the technical contexts in D1/D1E and D2, the board considers that a skilled person looking for alternatives to the pen ink composition in D1/D1E would have no reason to consult document D2. In particular, a skilled person starting from D1/D1E would not consider an additional treatment step with a compound used to reduce issues caused by extreme shear forces in vehicle painting systems, a problem that is unrelated to the field of writing instruments.

Document **D5**, like D2, relates to vehicle painting compositions and addresses the problem of coating instability within the context of the automobile industry (page 2, lines 14-15). The treatment with silanes according to D5 is intended to improve adhesion with the surrounding lacquer/solvent and promote orientation of the pigment particles (see page 2, lines 45-48). As in the case of D2, it is not apparent for the board why a skilled person looking for alternatives for ink compositions for writing utensils would consult the field of vehicle painting. Moreover, as noted by the proprietor, there is no indication in par. [0028] of D1/D1E of the type of treatment that can be performed in advance (i.e. the pre-treatment). Since the only indication is that such treatment can be performed using a phosphoric acid solution, it seems that the proposed step is more related to the preparation of the surface than to the provision of an additional passivating agent. In any case, since the main idea in D1/D1E is that a surface treatment with

polyethylene ether phosphates having the specific formula proposed in par. [0006] effectively suppresses the reaction of aluminum and water, there would be no reason to incorporate pre-treatment steps which involve a surface treatment with a different substance, as this would be expected to significantly affect the incorporation of the compound proposed in D1/D1E onto the particle surface and/or the effects of the surface treatment with the polyethylene ether phosphate. The board therefore concludes that a skilled person starting from D1/D1E and looking for alternatives would not contemplate using the silane compounds in D5 as a pre-treatment of the aluminum pigment.

The solution proposed in **D4** would also not render claim 1 obvious, because while this document also solves the problem of corrosion of aluminium in an aqueous composition, the silanes are not intended to be chemically bonded to the aluminum particle (as defined in claim 1), but to provide a binding network between an oxide metal and an oligomer/polymer. Thus, the combination of D1/D1E and D4 would likely imply substituting the surfactant coating proposed in D1/D1E with a hybrid inorganic/organic layer as proposed in D4, a solution which would include the presence of the silane, but which would not fall within the scope of claim 1 at issue. Furthermore, this document discloses (see par. [0046]) multiple silanes, from which only a few fall within the scope of claim 1 at issue, so a further selection would be required to arrive at the subject-matter of claim 1.

The situation in **D6** is analogous to that of D4, because while the use of silane in this case is part of a solution to the problem of degradation of aluminum in the presence of water (see par. [0007]), there is no

reason to consider incorporating the silane coating in isolation from the other coatings proposed in D6 (i.e. molybdenum oxide, molybdenum hydrate and amorphous silica), let alone to combine the silane coating with the polyoxyethylene alkyl ether phosphate proposed in D1/D1E and in claim 1 at issue. Furthermore, only some of the silanes disclosed in D6 (see formula in par. [0029] and list in par. [0067]) fall within the scope of claim 1 at issue, so even if documents D1/D1E and D6 were combined, a further selection would be required to arrive at the subject-matter of claim 1. It is also noted that none of the examples in D6 include a silane covered by formula (1), so that there is no particular pointer to the selection of a silane falling within the scope of the invention.

- 3.6 The other alternative starting points D7/D7E and D8/D8E also disclose ink compositions for writing utensils. Since, as indicated in the discussion of the closest prior art, the disclosure of these documents is substantially equivalent to that of D1/D1E, the above argumentation would also apply when starting from D7/D7E or D8/D8E as the closest prior art.
- 3.7 Since none of the combinations proposed by the appellant renders the invention obvious, the subject-matter of the claims according to auxiliary request 2 is considered to meet the requirements of Article 56 EPC.
4. The board therefore concludes that none of the objections raised by the appellant prejudices the maintenance of the patent on the basis of the claims of auxiliary request 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 to maintain the patent in amended form based on the claims of auxiliary request 2 filed with the reply of 3 March 2020 and a description to be adapted where appropriate.

The Registrar:

The Chairman:



A. Pinna

J.-M. Schwaller

Decision electronically authenticated