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Datasheet for the decision of 10 July 2017

Case Number: T 1949/12 - 3.4.02

Application Number: 08754622.2

Publication Number: 2149038

IPC: G01J3/46

Language of the proceedings: EN

Title of invention:
METHOD FOR COLOR MATCHING

Applicant:
Coatings Foreign IP Co. LLC

Headword:

Relevant legal provisions:
EPÜ Art. 56
EPC Art. 54(3)

Keyword:
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

Catchword:

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Case Number: T 1949/12 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 10 July 2017

Appellant: (Applicant)	Coatings Foreign IP Co. LLC The Corporation Trust Company Corporation Trust Center 1209 Orange Street Wilmington, DE 19801 (US)
Representative:	Lorenz & Kopf PartG mbB Patentanwälte, LKGLOBAL Brienner Straße 11 80333 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 12 April 2012 refusing European patent application No. 08754622.2 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	R. Bekkering
Members:	H. von Gronau
	B. Müller

Summary of Facts and Submissions

I. The appeal of the applicant is directed against the decision of the examining division to refuse the European patent application No. 08754622.2. The examining division refused the application in particular on the ground that the independent claims were not clear and that the subject-matter of the independent claims did not involve an inventive step.

II. With the statement setting out the grounds of appeal, the appellant requested that the decision of the examining division be set aside and a patent be granted on the basis of the claims according to the main request filed with the grounds of appeal and a description to be adapted. Claim 1 of the main request combines the two options of original independent claims 1 and 3.

The appellant further requested the grant of a patent on the basis of the claims according to one of auxiliary requests 1 to 4, all filed with the grounds of appeal and of a description to be adapted.

As a precaution the appellant requested that oral proceedings be held.

III. In a communication pursuant to Rule 100(2) EPC the board expressed the provisional opinion that the claims of the main request essentially met the novelty and inventive step requirements but that the claims were not clear pursuant to Article 84 EPC. The board also noted that the appellant had not filed an adapted description.

IV. With a letter dated 27 June 2017 the appellant filed a new set of claims 1 - 7 as a new main request and amended description pages 2, 2a, 2b and 3 to replace original description pages 2 and 3.

V. As a new main request the appellant requested that the decision of the examining division be set aside and that a patent be granted on the following application documents:

- claims, No. 1 - 7 according to the main request filed with letter of 27 June 2017;
- description, pages 1 and 4 - 14 as originally filed;
- description, pages 2, 2a, 2b and 3 filed with the letter of 27 June 2017;
- Drawings, sheets 1/9 - 9/9 as originally filed.

The appellant further requested the grant of a patent on the basis of the claims according to one of auxiliary requests 1 to 4, all filed with the grounds of appeal.

VI. The following documents were cited in the examination proceedings:

D1: US 2004/0252883 A1
D2: US 6 449 045 B1
D3: EP 0 444 689 A
D4: WO 2008/024295 A

VII. Independent claim 1 of the main request as filed with the letter of 27 June 2017 reads as follows:

"A method for matching a reference color formulation to a defined color shade standard comprising (I):

1. Measuring a reflectance spectrum R_{ST} of the color shade standard,
2. Identifying a recipe for the color shade standard from a database containing color recipes and the corresponding measured reflection spectra R_{PT},
3. Calculating the theoretical reflectance spectrum R_{RPT} for the identified recipe,
4. Calculating the difference spectrum ΔR between the measured reflectance spectrum R_{PT} and the calculated reflectance spectrum R_{RPT} obtained in step 3,
5. Adjusting the reflectance spectrum R_{ST} of the color shade standard with the difference spectrum ΔR obtained in step 4 and creating a modified reflectance spectrum R_{STM} of the color shade standard,
6. Calculating a recipe on basis of the modified reflectance spectrum R_{STM},
7. Mixing a paint according to the recipe calculated in step 6 and applying the paint to a substrate; or,

comprising (II):

1. Determining experimentally color coordinates C_{ST} of the color shade standard,
2. Identifying a recipe for the color shade standard from a database containing color recipes and the corresponding experimentally determined color coordinates C_{PT},
3. Calculating the theoretical color coordinates C_{RPT} for the identified recipe,
4. Calculating the difference ΔC between the experimentally determined color coordinates C_{PT} corresponding to the identified recipe and the calculated color coordinates C_{RPT} obtained in step 3,
5. Adjusting the color coordinates C_{ST} of the color shade standard with the difference of the color coordinates ΔC obtained in step 4 and creating modified color coordinates C_{STM} of the color shade standard,

6. Calculating a recipe on basis of the modified color coordinates C_{STM},
7. Mixing a paint according to the recipe calculated in step 6 and applying the paint to a substrate."

Reasons for the Decision

1. Main request - lack of clarity and lack of disclosure of the invention (Articles 84 and 83 EPC)

1.1 The examining division in its decision raised the following objections of lack of clarity and lack of disclosure:

a) The expression "color shade standard" was not clear because it referred to a surface of a substrate to be repair coated and was a sample of unknown and undefined color. It was unclear which additional limitation was imposed by the word "standard". It appeared to imply a sample of a previously known and standardized color.
b) It was not clear from the wording of the claims and the description what the step of "measuring" a spectrum or color comprised. Typically in spectral and color measurements all sorts of calibrations and corrections were applied. In the present method it was completely left open which amount of calibration correction was performed with the raw sensor data.
c) It was not clear which concrete steps should be encompassed by the term "calculating a recipe on the basis of the modified reflectance spectrum". Neither from the claims nor from the description was it clear whether the matching process between the corrected sample spectrum and the recipe spectra should be performed in the corrected or in the uncorrected sample color space or sample color spectra.

1.2 In the grounds of appeal:

a) The appellant did not see a lack of clarity in the expression "color shade standard". The unknown color that should be reproduced by the current method was designated as standard. It was usual practice in the art to designate a color to be realized as standard. In addition on page 6 of the description it was explained that the expression "color shade standard" was used for the color of a surface to be repaired. This color of a surface was not intended to correspond to a standard color tone.

b) The appellant did not see either a lack of clarity in the expression "measuring a spectrum or color". Measurements were performed with a usual spectrophotometer and it could be assumed that it was used and calibrated according to the instructions of the manufacturer. For the present invention it was of no importance which kind of measuring device was used and how it was calibrated. The concept of the present invention was to minimise all sorts of errors of the whole method with the help of the difference spectrum.

c) The appellant did not see a lack of clarity in the definition "calculating a recipe on the basis of the modified reflectance spectrum". The appellant explained that the modified reflectance spectrum R_{STM} was taken to calculate a new and adapted recipe. The calculation was performed according to usual methods. The appellant did not see a lack of clarity in this respect. On page 7, lines 12 to 18 of the description it was explained how the adapted recipe was created with a given colorant system. Therefore the person skilled in the art had no difficulty to carry out the invention.

1.3 The board concurs with the view of the appellant on all points and does not see a lack of clarity in claim 1 or a lack of disclosure of the invention.

2. Main request - claim 1 - novelty and inventive step in relation to D1 (Articles 54(4) and 56 EPC)

2.1 The examining division took document D1, which it considered to be the closest prior art document, as a starting point. Document D1 disclosed a method for matching a reference color formulation to a defined color shade standard with the following steps (cf. figure 5):
- measuring a reflectance spectrum R_{STD} of a color shade standard,
- identifying a recipe for the color shade standard from a database containing color recipes and the corresponding measured reflection spectra R_{PT} (cf. 0054),
- mixing a paint according to the recipe found in the data base and applying the paint to a substrate.

Document D1 did not disclose the steps of:
- calculating the theoretical reflectance spectrum R_{RPT} for the identified recipe,
- calculating the difference spectrum ΔR between the measured reflectance spectrum R_{PT} and the calculated reflectance spectrum R_{RPT},
- adjusting the reflectance spectrum R_{ST} of the color shade standard with the difference spectrum ΔR and creating a modified reflectance spectrum R_{STM} of the color shade standard,
- calculating a recipe on basis of the modified reflectance spectrum R_{STM}.

2.2 The appellant essentially agreed with this analysis.

2.3 The board also agrees. Therefore, the subject-matter of claim 1 is new over document D1.

2.4 The examining division argued that, in the system underlying the application, a difference existed between the spectra/colors calculated theoretically from e.g. a certain recipe of colorants and the spectra/color as output from a spectrometer/colorimeter when a sample coated with a paint according to this recipe was actually measured. It was understood that this problem caused subsequently slow convergence of the matching process and that the difference was generally not a global offset (e.g. in a color space) but a local correction amount depending on the measured color.
Thus the problem underlying the present claims could be formulated as correcting the mismatch between measured and calculated colors in a color matching process.

2.5 The appellant also identified the **effect** of the differing features as increasing the efficiency of the color shading process, in particular reducing the iterations of a color shading process and improving convergence. The **problem** was therefore to improve the convergence properties of known recipe correction methods and to increase the efficiency of shading processes.
The appellant was of the opinion that the problem identified by the examining division (correcting the mismatch between measured and calculated colors in a color matching process) was based on hindsight. The idea to use the difference spectrum was already part of the solution.

2.6 The board agrees with the appellant. The problem identified by the examining division contains a pointer to the solution: Document D1 does not suggest calculating the theoretical reflectance spectrum from the identified recipe. It therefore does not suggest calculating the difference spectrum between the measured reflectance spectrum and the calculated reflectance spectrum. In view of document D1 the problem cannot be defined to correct this mismatch. In the embodiment shown in Figure 5 (cf. paragraph 0063) of document D1 a standard is measured, the measured standard is then matched by a matching step to obtain a recipe, the recipe is mixed and sprayed. The dried panel is measured and the result is compared with the standard. If the difference does not meet the specifications, a correction to the recipe is carried out and the process is repeated. Thus starting from document D1 the problem is to improve the convergence properties of the known method and to increase the efficiency of the shading processes.

2.7 The examining division was of the opinion that in claim 1 it was somehow implied to determine the correction amounts by comparing the calculated recipe spectra or colors with the actually measured spectra or colors and using the difference as a correction. It then summarized the claimed invention as calibrating the measurement instrument such as to match the space of theoretically calculated recipe spectra or colors as closely as possible. This concept was implemented in the form of a database, providing a correction value for each known recipe, i.e. a look-up table with suitable correction values.
However, the calibration of spectrometric instruments and the provision of correction look-up tables were well known in the art of color matching. E.g. document

D2 (cf. column 4, line 33 - column 6, line 49) disclosed a correction method, where, with the help of a first correction look-up table comprising correction values derived from training samples, the measured sensor array voltages were corrected to yield the measured reflectance at mean LED wavelengths (cf. column 5, line 42-45).
A further example of a spectral correction was disclosed in D3 (cf. column 27, line 27 - column 28, line 17, Fig 7-9), where again correction values for each spectral segment were obtained by comparing certain standard training samples, the correction values were stored in an instrument memory and were applied to the measured values.

2.8 The appellant was of the opinion that the essence of the present invention lay in the fact that calculating the difference between the measured reflectance spectrum R_{PT} and the calculated theoretical reflectance spectrum R_{RPT} was regarded as a measure for all kind of errors in the shading process. Such errors were e.g. errors in setting up the recipe database, errors in the radiation transport model when calculating color recipes, errors in the optical parameter of the material, errors in the process of weighing, applying and drying. Thus the difference included not only errors that were due to measuring instruments but all kind of errors in the whole process.
None of the cited documents suggested such a solution. Document D2 taught to modify voltage signals of a measuring instrument using calibration look-up tables. It was not known from document D2 to use a difference spectrum between a measured reflectance spectrum and a calculated theoretical reflectance spectrum. Document D3 disclosed a compensation method for color measuring devices compensating changes in the intensity and

temperature of a lamp. Document D3 also did not use a difference spectrum between a measured reflectance spectrum and a calculated theoretical reflectance spectrum.

2.9 The board agrees with the appellant. The calculated difference ΔR or ΔC in claim 1 reflects all sorts of deficiencies in the process of calculating recipes, mixing the paint, spraying the paint on a panel and measuring the reflectance or color in performing the claimed steps or setting up the database.

The board has doubts whether the person skilled in the art would even consider documents D2 or D3 in view of the above identified problem (improve the convergence properties of known recipe correction methods and to increase the efficiency of shading processes). These documents do not deal with the calculation and correction of paint recipes.
But even if the person skilled in the art were to consider these documents, it would not arrive at the claimed subject-matter, because not all differing features are disclosed in documents D2 or D3. In particular the step of calculating the theoretical reflectance spectrum R_{RPT} for the identified recipe, and subsequently the step of calculating the difference spectrum ΔR between the measured reflectance spectrum and the calculated reflectance spectrum are not disclosed in these documents.

Therefore, the subject-matter of claim 1 involves an inventive step in view of document D1 in combination with documents D2 or D3.

3. Main request - claim 1 - novelty (Article 54(3) EPC) in relation to D4

3.1 As "obiter dictum" the examining division also raised a lack of novelty objection with regard to document D4. Document D4 is a PCT application for which the European Patent Office is a designated office and which was accorded an international date of filing and claims priority from US application 60/839 347. The international filing date is 17 August 2007 and the priority date is 22 August 2006. The international application was published on 28 February 2008. Document D4 is therefore considered prior art under Articles 54(3), 89, 153(2) EPC.

3.2 According to the examining division document D4 disclosed a method with all steps of the claimed invention (cf. D4, claim 1, pages 6-8 of the description).

However, the appellant did not agree with the examining division that step 2 of the claimed method was also known from D4. According to step 2 of the claimed invention a recipe for the color shade standard was identified from a database containing color recipes and the corresponding measured reflection spectra R_{PT}.

3.3 The examining division put forward that the establishment of a database with recipes and measured spectra implied inherently the spraying out of the paints and carrying out the respective measurements. Therefore, although not explicitly mentioned in the present claim, this step of spraying out the paint was inherent in the method disclosed in the present application.

Moreover, D4 taught explicitly that the recipes and the optical material parameters were stored in a database (p. 7, paragraph 4, last line).
In addition, at least in one variant D4 taught to perform the measurement of the spectrum R_{PT} before the recalculation of the theoretical reflectance spectrum (cf. D4, page 7, paragraph 4). Thus, after measuring the spectrum R_{PT} it had to be stored for later use after the recalculation step, and in step 5 of D4 (calculating the difference spectrum), the stored spectrum had to be retrieved from this storage place. This step was considered as implying the claimed feature 2, i.e. "Identifying a recipe for the color shade standard from a database containing color recipes and the corresponding measured reflection spectra RPT", because any retrieval of the stored spectrum inevitably required the identification of the spectrum corresponding to the desired recipe.

3.4 The appellant did not agree. The person skilled in the art knew the principle and the use of a database for readjusting color shades. Such databases typically contained a plurality of recipes and corresponding reflection spectra and the spectrum that came closest to the color shade standard was selected for further use. These spectra and recipes were not created in view of the color shade standard to be readjusted, but all recipes were created in advance, independent of a later color shade standard.
The database mentioned in document D4 was used to store optical material parameters of the colored pigments of the recipe, which had been experimentally determined in advance. But this database could not be considered relevant for the particular feature of the present invention.

The appellant did not agree that according to an embodiment in document D4 storing the measurement data of the spectrum for later calculation could be considered as a database. This fictitious short term storing of measured reflectance spectrum data was not comparable with a plurality of pre-stored recipes and reflectance spectra. The use of a database was not implicitly disclosed in document D4 so that it would be included in its contents by the person skilled in the art. Even if the person skilled in the art reading document D4 considered the use of a database for finding a color shade recipe as an alternative, this would not be relevant for the novelty of the subject-matter of claim 1.

3.5 The board agrees with the position of the appellant. The use of a database containing color recipes and the corresponding measured reflection spectra are not explicitly disclosed in document D4. In the method of document D4 a paint is mixed according to a recipe for the color shade standard and it is not disclosed that the recipe comes from a database. The database mentioned in document D4 is used to store optical material parameters of the colored pigments of the recipe. A database with color recipes and corresponding measured reflection spectra is not implicitly disclosed either. The measurement data might be stored temporarily for further processing, but this does not result in a storage containing a plurality of color recipes and the corresponding measured reflection spectra. The board therefore concludes that the subject-matter of claim 1 is new in view of document D4.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to grant a patent in the following version:

Description:
Pages 1 and 4 - 14 as originally filed.
Pages 2, 2a, 2b and 3 filed with the letter of 27 June 2017.

Claims:
No. 1 - 7 filed with the letter of 27 June 2017.

Drawings:
Sheets 1/9 - 9/9 as originally filed.

The Registrar: The Chairman:

M. Kiehl R. Bekkering

Decision electronically authenticated