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D E C I S I O N
of 11 July 2000

Case Number: T 0977/96 - 3.5.1

Application Number: 90118618.9

Publication Number: 0420259

IPC: H04N 1/46

Language of the proceedings: EN

Title of invention:
Colour image recording method and apparatus

Applicant:
CANON KABUSHIKI KAISHA

Opponent:
-

Headword:
Colour image pattern/CANON

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (no)"

Decisions cited:
-

Catchword:
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Case Number: T 0977/96 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 11 July 2000

Appellant: CANON KABUSHIKI KAISHA
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 21 May 1996 refusing European patent application No. 90 118 618.9 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: P. K. J. van den Berg
Members: R. R. K. Zimmermann
P. H. Mühlens

Summary of Facts and Submissions

I. The appeal concerns European application No. 90 118 618.9 (publication No. 0 420 259, priority date: 28 September 1989). The application was refused by a decision of the examining division under Article 97(1) EPC essentially for the reason that the subject-matter of claim 1 lacks an inventive step in view of publications EP-A-0 317 268 (document D3, publication date: 24 May 1989) and JP-A-01041375 (laid-open date: 13 February 1989; translation filed with letter dated 14 September 1995 and cited as document D8').

II. The examining division took the view that document D3 with reference to figures 1 to 19 described a colour image recording apparatus (colour copying machine) comprising a plurality of recording elements for ejecting the ink jet ink of the corresponding ink colour. For improving printing quality, the recording elements were driven by a maximum density signal FF_H so as to produce a test pattern showing the non-uniform recording characteristic of each single recording element. The test pattern was then detected and the data used to correct the individual recording elements.

The subject-matter of claim 1 differed from the prior art of document D3 in that the claimed apparatus was arranged to print a test pattern which comprised mixed pattern elements formed by using a mixture of at least two of said colours and to take into account the detection values from these pattern elements when correcting non-uniformity. This feature, however,

resulted in an obvious manner from the general technical knowledge of a skilled person as well as explicitly from document D8' which disclosed the use of such type of test pattern for correcting the output characteristic of ink-jet type printers.

III. Against this decision, posted on 21 May 1996, the appellant filed a notice of appeal on 22 July 1996, requesting complete reversal of the decision under appeal. The appeal fee was paid the same day; the grounds of appeal including an amended set of claims were subsequently filed on 27 September 1996. Claim 1 now includes additional features according to which the "detecting means detects a chromaticity of the pattern elements corresponding to said recording elements, respectively," and the "control means controls the respective recording elements on the basis of the chromaticity to correct density non-uniformity, in said direction, produced upon said color mixture".

In preparation of oral proceedings the Board informed the appellant that some definitions present in claim 1 did not have full support in the application documents as originally filed and that the requirement of inventive step was not met. In response, the appellant filed an amended claim 1 with a letter dated 13 June 2000. In oral proceedings held before the Board on 11 July 2000, the matters in issue were discussed with the representative. The decision on the appeal was then announced on the basis of the following requests:

The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the following points:

claims 1 to 13 filed with letter of 27 September 1996 as main request;

claim 1 filed with letter of 13 June 2000 as first auxiliary request; and

claim 1 filed during the oral proceedings as second auxiliary request.

Claim 1 according to the main request reads as follows:

"1. A color image recording apparatus, comprising:

(a) recording means having a plurality of recording elements (24a, 24b, 24c) for each of a plurality of colours to form a color image;

(b) means for causing said recording means to form a test pattern ($S4_2$) using color data each of which has a density which is constant in a direction in which each one of the plurality of recording elements are arranged;

(c) detecting means (25, 101) for detecting a density non-uniformity in said direction and providing a corresponding output;

(d) control means (29a, 29b, 29c, 22a, 22b, 22c) for controlling said recording means in accordance with said output of said detecting means,

CHARACTERIZED IN THAT

(e) the test pattern comprises mixed pattern elements formed by using a mixture of at least two of said colours;

(f) wherein said detecting means detects a chromaticity of the pattern elements corresponding to said recording elements, respectively;

(g) wherein said control means controls the respective recording elements on the basis of the chromaticity to correct density non-uniformity, in said direction, produced upon said color mixture."

Claim 1 according to the first auxiliary request reads as follows:

"1. A color image recording apparatus, comprising

(a) recording means having a plurality of recording elements for each of a plurality of a plurality of colours to form a color image;

(b) means for causing said recording means to form a test pattern by using said recording means;

(c) detecting means for detecting a density non-uniformity in said test pattern and providing a corresponding output;

(d) control means for controlling said recording means in accordance with said output of said detection means;

characterized in that

(e) the test pattern comprises a uniform mixed pattern formed by using the plurality of the recording elements for different colours;

(f) wherein said detecting means detects a chromaticity of pattern elements included in said uniform mixed pattern corresponding to said each of recording elements, respectively;

(g) wherein said control means controls the respective recording elements on the basis of the chromaticity of correct density non-uniformity, produced upon said uniform mixed pattern."

Claim 1 of the second auxiliary request differs from claim 1 of the first auxiliary request by following amendments: The reference signs already present in lines 3, 6, 9, and 12 of claim 1 of the main request are added at the corresponding places in lines 3, 6, 7, and 10 of the claim; the expression "detection means" in line 11 of claim 1 of the first auxiliary request is amended to "detecting means"; in line 21 of claim 1 of the first auxiliary request, the wording "the chromaticity of" is replaced by "the detected chromaticity to"; and after the words "mixed pattern" in line 23 of claim 1 of the first auxiliary request the text "; and (h) wherein said detected chromaticity comprises a chromaticity of a mixed color" is added.

IV. According to the appellant the first and second auxiliary requests were only intended to meet the objection of added subject-matter as raised by the Board and to clarify the contribution provided by the invention to the prior art.

In support of inventive step the appellant brought forward the following arguments:

The closest prior art, document D3, addressed the problem of non-uniform characteristics of the heads of a multi-nozzle head ink-jet type colour printer. However, the colour test pattern used for correction did not include mixed colour elements for correcting non-uniformities which showed up only in mixed colour recording. In addition, there was no hint to correct each single recording element on the basis of the measured chromaticities of all the single colour and mixed colour elements of the test pattern which provided an extended and improved basis for the correction.

Document D8', although referring to the use of "mixed colour patches", disclosed a very different type of colour printer so that combining documents D3 and D8' would not be obvious.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC and is thus admissible.

Regarding the merits of the case, the principal issue to be decided is whether the invention as claimed meets the requirement of inventive step within the meaning of Article 56 EPC.

2. *Main request*

2.1 The appellant considered document D3 as the closest piece of prior art and the appropriate starting point for assessing inventive step. The Board does not see any reason to take a different view.

2.2 According to the decision under appeal the subject-matter of the preamble of claim 1 was *in toto* anticipated by the prior art copying machine of document D3; this document, however, did not disclose the use of mixed colour pattern elements. This analysis of document D3 has not been questioned by the appellant and is, in the view of the Board, basically correct.

The further features (f) and (g) of present claim 1 refer to the detection of "a chromaticity of the pattern elements" and its use for correction. The prior art scanner of document D3 produces RGB colour data (see page 7, lines 18 ff.), the measured data of the test patterns being stored and processed for each individual head, i.e. for all C,M,Y,K- heads (see figure 3), to determine for each individual recording element (nozzle) a correction coefficient α_i (see page 10, line 33 ff.). Since this correction coefficient is the quotient of two intensity values for a single colour, the luminance factor is eliminated so that the correction is in fact performed on the basis of the measured chromaticity of the respective test pattern colour. This is not a surprising result since in first order the gradation is normally assumed to be a linear function passing through zero (compare document D3, page 12, line 7).

It follows that features (f) and (g) of claim 1 do not provide any additional contribution to the prior art copying machine of document D3. Including mixed colour pattern elements into the test pattern and using their chromaticity for correction is therefore the only difference between the alleged invention and the closest piece of prior art.

2.3 The appellant argued that these features allowed to correct for non-uniformities which showed up only in mixed colour recording and which were thus not detectible by using single colour test patterns.

However, including mixed colour elements into the test pattern does not ensure that such type of density non-uniformities are corrected since the measured non-uniformity is the sum of all sorts of non-uniformities, not specifically the result of such mixed-colour effects. Furthermore, pattern elements having different colours, pure or mixed colours, have different chromaticities. Claim 1, refers only to "a" chromaticity without specifying the pattern element, single coloured or mixed coloured, of which the chromaticity is detected. Finally, the claim lacks any feature indicating how and with which result the amount of correction is determined "on the basis of the chromaticity".

Therefore, the claim does not allow to derive any specific technical effects from the use of mixed colour pattern elements.

2.4 Furthermore, the appellant argued that the invention proposed the correction of each single recording element on the basis of the measured chromaticities of all the single colour and mixed colour elements of the test pattern.

The Board disagrees with this interpretation of claim 1: the wording, albeit being broad, does clearly not provide for such a feature. Even if, as the appellant argued, this feature is assumed to result from the least squares method described on page 4, this would not prove the feature being essential for the

invention since the following page of application states clearly that the invention is not limited to the use of the least squares method. A "simple average or a weight average with giving weights to the respective test patterns" would rather do as well.

It follows that the only technical problem which is objectively solved with respect to document D3 by the invention as claimed is providing an alternative for the pure colour test patterns proposed in document D3.

2.5 In the decision under appeal document D8' was considered to disclose the use of mixed pattern elements for the correction of density non-uniformity. In fact, document D8' explicitly discloses gradation and hue correction in digital printers of the fluid-jet type for reducing deviations from the desired output characteristic which occur in digital printers for various technical reasons (see pages 3 f.). On page 5, the document explains that a possible solution is a correction of the output characteristic on the basis of measuring the gradation characteristics of "printed gray scales". In the case of a colour printer monochromatic colour scales and mixed colour patches should be used as a test output pattern to determine the parameters for the gradation correction (see page 7, second paragraph and page 20, first paragraph).

It is certainly evident to the skilled person that density non-uniformity may result from variations in the gradation and/or colour output characteristics so that document D8' gives the skilled person a clear indication to include mixed colour pattern elements into the test pattern as a possible and obvious alternative to the use of single colour patterns as proposed in document D3. The subject-matter of claim 1 does thus not involve an inventive step; accordingly the main request is not allowable.

3. *First auxiliary request*

As indicated by the appellant the amendments according to the first auxiliary request were not intended to change the claimed subject-matter in any substantive manner. Claim 1 in fact defines essentially the same subject-matter as claim 1 of the main request, partly in different terms, and does thus not provide any additional inventive contribution to the prior art. Therefore, the first auxiliary request is not allowable for the same reason as the main request.

4. *Second auxiliary request*

Claim 1 of the second auxiliary request is substantially identical with claim 1 of the first auxiliary request, except for feature (h) which was added to define clearly that the chromaticity of the mixed colour elements is used for correction.

However, this feature derives directly from claim 1 of document D8' stating that the chromaticity values of the "reference colour patches" are detected and used for making gradation and hue correction. Feature (h) of claim 1 does thus not provide an inventive contribution to the prior art; the second auxiliary request is not allowable either.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Kiehl P. K. J. van den Berg