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Datasheet for the decision of 12 November 2009

Case Number: T 1641/07 - 3.2.05

Application Number: 98301559.5

Publication Number: 0863004

IPC: B41J 2/04

Language of the proceedings: EN

Title of invention:
Dynamic multi-pass print mode corrections to compensate for malfunctioning inkjet nozzles

Patentee:
Hewlett-Packard Company

Opponent:
Océ-Technologies B.V.

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Relevant legal provisions (EPC 1973):
-

Keyword:
"Novelty (main request, no)"
"Inventive step (first auxiliary request, no; second auxiliary request, yes)"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 1641/07 - 3.2.05

D E C I S I O N
of the Technical Board of Appeal 3.2.05
of 12 November 2009

Appellant: (Opponent)
Océ-Technologies B.V.
St. Urbanusweg 43
NL-5914 CC Venlo (NL)

Representative:
Vanoppen, Ronny R.J.
Océ-Technologies B.V.
Corporate Patents
Postbus 101
NL-5900 MA Venlo (NL)

Respondent: (Patent Proprietor)
Hewlett-Packard Company
(a Delaware Corporation)
3000 Hanover Street
Palo Alto CA 94304 (US)

Representative:
Small, Gary James
Carpmaels & Ransford
43-45 Bloomsbury Square
London WC1A 2RA (GB)

Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 19 July 2007 rejecting the opposition filed against European patent No. 0863004 pursuant to Article 102(2) EPC 1973.**

Composition of the Board:

Chairman: W. Zellhuber
Members: P. Michel
M. J. Vogel

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the decision of the Opposition Division rejecting the opposition filed against European Patent No. 0 863 004.

II. Oral proceedings were held before the Board of Appeal on 12 November 2009.

III. The appellant requested that the decision under appeal be set aside and that the European patent No. 0 863 004 be revoked.

The respondent (patentee) requested that the appeal be dismissed (main request) and as an auxiliary measure, that the decision under appeal be set aside and the patent in suit be maintained on the basis of claims 1 - 12, filed as first auxiliary request on 9 October 2009, or claims 1 - 11, filed as second auxiliary request during the oral proceedings.

IV. The following document is referred to in this decision:

D3: EP-A-0 568 283

V. Claim 1 according to the main request (claim 1 as granted) reads as follows:

"1. A method of correcting for malfunctioning ink ejection elements in a printing system using multiple passes over a recording medium, comprising the steps of: obtaining (60) a first printmask identifying each one of the ink ejection elements capable to print in each

corresponding one of said multiple passes on a physical location of the recording medium;
identifying (62) ink ejection elements which are malfunctioning;
ascertaining (64) from the first printmask alternative replacement ink ejection elements for the ejection elements which are malfunctioning;
selecting (66) replacement ink ejection elements from the alternative replacement ink ejection elements; and
modifying (68) the first printmask by removing the malfunctioning ink ejection elements from the printmask and replacing them with the selected replacement ink ejection elements to create a modified printmask."

Claim 1 of the first auxiliary request differs from claim 1 of the main request in that the words "multiple passes over" are replaced by "a four or more pass print mode to print on" and in that the words "capable to print in each corresponding one of said multiple passes on a physical location of the recording medium" are replaced by "on a physical location of the recording medium in each pass over the location in said four or more print pass mode".

Claim 1 of the second auxiliary request differs from claim 1 of the first auxiliary request in that the words "such that the selected replacement ink ejection element is used in a non-adjacent pass" are added after the words "selecting (66) replacement ink ejection elements from the alternative replacement ink ejection elements".

VI. In the written and oral proceedings, the appellant has argued substantially as follows:

Claim 1 of the main request includes the case in which two passes over a recording medium are used. In a two pass mode, only one potential replacement is possible.

Document D3 discloses, with particular reference to complement example 1, described at column 9, line 1 to column 10, line 25, a method of correcting for malfunctioning ink ejection elements in a printing system using two passes. Image data is divided between the two passes. In the event of an abnormal nozzle being detected, the image data is transferred from one pass to the other. The printmask, which defines for each pixel in which pass and by which nozzle it is printed, is correspondingly modified.

The subject-matter of claim 1 of the main request is thus not new.

It does not involve an inventive step to apply the teaching of document D3 to a four or more pass print mode. The passage at column 13, lines 45 to 49, relates to a two pass print mode. If a replacement nozzle fails, it is quite logical to go to the next replacement nozzle in accordance with column 11, lines 16 to 26 of document D3.

The subject-matter of claim 1 of the first auxiliary request thus does not involve an inventive step.

Document D3 discloses that, in the case of a print mode having three or more passes, scan data from the trailing print block is transferred to the leading print block (column 11, lines 16 to 26). This indicates

that a replacement ink ejection element from a non-adjacent pass may be used. Document D3 does not express a preference for an adjacent scan, so that the choice of a non-adjacent scan is merely a routine alternative.

The subject-matter of claim 1 of the second auxiliary request thus does not involve an inventive step.

VII. In the written and oral proceedings, the respondent has argued substantially as follows:

Claim 1 of the patent in suit relates to a method of correcting for malfunctioning ink ejection elements in a printing system using multiple passes over a recording medium, and specifies the steps of ascertaining from the first printmask alternative replacement ink ejection elements for the ejection elements which are malfunctioning; and selecting replacement ink ejection elements from the alternative replacement ink ejection elements. There is no suggestion in document D3 of these steps.

Document D3 merely suggests using a single, predefined alternative replacement ink ejection element. As stated at column 13, lines 45 to 49, if the replacement nozzle is also defective, printing is stopped. Since, according to document D3, the complement nozzle is already known, there is no need to refer to the printmask.

Whilst the result of the correction may well be the same, it should be noted that claim 1 is directed to a method of correction which is distinguished from that disclosed in document D3.

The subject-matter of claim 1 of the main request is thus new.

The method disclosed in document D3 envisages the use of only one complementary nozzle. Thus, when the complementary nozzle is also defective, the printhead must be discarded (see column 13, lines 45 to 49).

The method as claimed in claim 1 of the first auxiliary request thus has the advantages of extending the life of the printhead and allowing the most appropriate replacement nozzle to be picked.

There is no motivation for the person skilled in the art to ignore or depart from the method of document D3.

The subject-matter of claim 1 of the first auxiliary request thus involves an inventive step.

Document D3 discloses that a replacement ink ejection element from the next pass should be used. There is no suggestion in document D3 that an element in a non-adjacent pass should be used.

The use of an element in a non-adjacent pass gives rise to the advantage that the optimum firing frequency of the nozzles is not exceeded. This problem is not addressed in the prior art and is solved in a manner not suggested by the prior art.

The subject-matter of claim 1 of the second auxiliary request thus involves an inventive step.

Reasons for the Decision

1. *Main request*

1.1 Novelty

Claim 1 of the patent in suit relates to a method of correcting for malfunctioning ink ejection elements in a printing system using multiple passes over a recording medium, and thus includes within its scope a method which is used with a printmode comprising two passes (see patent in suit, paragraph [0041]). In such a method, there is only one possible replacement ink ejection element for any malfunctioning ink ejection element (see paragraphs [0042] and [0045] of the patent in suit). There are no alternative replacement ink ejection elements.

The term "printmask", as used in claim 1 is construed as meaning the schema by which each ink ejection element is allocated to one of a plurality of passes (see paragraph [0032] of the patent in suit). This corresponds to the step referred to as "dividing" in document D3 (column 9, lines 1 to 27 and Figures 10A and 10B).

Thus, when, in accordance with the teaching of document D3 at column 9, lines 31 to 44, image data is transferred from a first data set corresponding to a first scan to a second data set corresponding to a second scan, this corresponds to the feature of claim 1 according to which a first printmask is modified so as to create a modified printmask. Whilst document D3 refers to transferring image data rather than modifying

a printmask, the result of transferring the image data is a modified printmask.

Insofar as it is argued that, in the method disclosed in document D3, no step of selecting replacement ink ejection elements from the alternative replacement ink ejection elements takes place, this is equally the case in the method according to the patent in suit for a printmode comprising two passes. The reference to selecting in claim 1 must be construed as meaning selecting the nozzle capable of printing at the same location as the defective nozzle.

The subject-matter of claim 1 is thus not new.

2. *First auxiliary request*

2.1 Inventive step

Claim 1 specifies that a four or more pass print mode is used. Accordingly, the step of selecting replacement ink ejection elements involves selecting a replacement ink ejection element from the three or more alternative replacement ink ejection elements.

Document D3 only discloses two and three pass print modes. The subject-matter of claim 1 is thus distinguished over the disclosure of document D3.

It is known in the art that increasing the number of passes, whilst reducing the speed of printing, increases print quality. It is argued on behalf of the respondent that the method disclosed in document D3 does not involve a selection step, since it is

determined in advance which nozzle would replace any given defective nozzle. The selection step of claim 1 is not, however, construed as excluding a selection which is carried out on the basis of a predetermined rule, as disclosed in document D3 at column 14, lines 23 to 32 and illustrated in Figure 18. Thus, according to the patent in suit, paragraphs [0042] and [0043] indicate the criteria to be used for selecting which replacement nozzle should be used. Thus, the step of selection of a replacement ejection element on the basis of a predetermined rule, which must be carried out when it has been ascertained which ejection elements are malfunctioning, is the same in the method of document D3 and that of the patent in suit.

It is not accepted that the person skilled in the art would understand from the passage in document D3 at column 13, lines 45 to 49, that, in a three pass print mode, printing should be stopped if two complementary nozzles are both defective. This passage can only be seen as referring to a two pass print mode. In a three pass print mode, the person skilled in the art would be aware of the fact that two complementary nozzles are available, so that printing should not be stopped if the first complementary nozzle was defective. Thus, following the teaching of document D3 at column 14, lines 23 to 32, a defective nozzle in the first pass is replaced by a nozzle in the second pass. If that nozzle is also defective, it is replaced by a nozzle in the third pass. It is not accepted that the person skilled in the art should be regarded as being incapable of such logical reasoning which does not require the exercise of any imagination.

Thus, the method as claimed in claim 1 is not seen as involving ignoring or departing from the teaching of document D3, but is rather a logical development of the teaching of document D3 to a print mode involving an increase in the number of passes.

The subject-matter of claim 1 thus does not involve an inventive step.

3. *Second auxiliary request*

3.1 Inventive step

In the case of a three pass mode, document D3 proposes using a replacement nozzle from the second scan for a defective nozzle in the first scan, using a replacement nozzle from the third scan for a defective nozzle in the second scan, and using a replacement nozzle from the first scan for a defective nozzle in the second scan (see column 11, lines 16 to 26, column 14, lines 23 to 32 and figure 18). This gives rise to the disadvantage that the same nozzle has to fire in adjacent scans, so that either the optimum firing rate for the nozzles is exceeded, or printing is slowed.

The problem to be solved can thus be regarded as being to provide a method of correcting for malfunctioning ink ejection elements without exceeding the optimum firing rate of the nozzles and without reducing printing speed.

According to the invention, this problem is solved by selecting a replacement ink ejection element in a non-adjacent pass.

The cited prior art does not address the above problem and there is no suggestion of the claimed solution. The fact that, according to document D3, in the case of the last pass, the abnormal image data is transferred to a non-adjacent pass, i.e. the first pass, is not relevant. If the teaching of document D3 is followed, the abnormal image data is transferred to an adjacent pass in each case except for the last pass. There is thus no suggestion that the replacement ink ejection element should be selected from a non-adjacent pass.

The subject-matter of claim 1 thus involves an inventive step.

Claims 2 to 10 are appendant to claim 1 and relate to preferred features of the method of claim 1. Claim 11 relates to a method of printing comprising the method of correcting for malfunctioning ink ejection elements as claimed in any of claims 1 to 10. The subject-matter of claims 2 to 11 thus also involves an inventive step.

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 maintain the patent on the basis of the following documents:

   - claims 1 - 11, filed as second auxiliary request during the oral proceedings;

   - description, pages 3, 3a, 5 - 7, filed during the oral proceedings, and pages 2 and 4 as granted;

   - drawings, Figures 1 - 7, as granted.

The Registrar: The Chairman:

D. Meyfarth W. Zellhuber