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**Datasheet for the decision
of 12 July 2007**

Case Number: T 0950/05 - 3.2.05

Application Number: 00918326.0

Publication Number: 1165319

IPC: B41J 2/155

Language of the proceedings: EN

Title of invention:
Single-pass inkjet printing

Patentee:
Dimatix, Inc.

Opponent:
Xaar Technology Limited

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 84, 123(2)

Keyword:
"Reformatio in peius (main and fifth auxiliary requests, yes)"
"Novelty (first and fourth auxiliary requests, no)"
"Clarity (second and third auxiliary requests, no)"
"Added subject-matter (sixth and seventh auxiliary requests, yes)"
"Inventive step (eighth auxiliary request, no)"

Decisions cited:
G 0002/88, G 0006/88, G 0009/92

Catchword:
-



Case Number: T 0950/05 - 3.2.05

D E C I S I O N
of the Technical Board of Appeal 3.2.05
of 12 July 2007

Appellant: Xaar Technology Limited
(Opponent) Science Park
Milton Road
Cambridge CB4 0XR (GB)

Representative: Garratt, Peter Douglas
Mathys & Squire
120 Holborn
London EC1N 2SQ (GB)

Respondent: Dimatix, Inc.
(Patent Proprietor) 109 Etna Road
Lebanon NH 03766 (US)

Representative: Lang, Johannes
Patent- und Rechtsanwälte
Bardehle, Pagenberg, Dost,
Altenburg, Geissler
Postfach 86 06 20
D-81633 München (DE)

Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
18 May 2005 concerning maintenance of the
European No. 1165319 in amended form.

Composition of the Board:

Chairman: W. Zellhuber
Members: P. Michel
C. Rennie-Smith

Summary of Facts and Submissions

- I. The appellant (opponent) lodged an appeal against the interlocutory decision of the Opposition Division maintaining European patent No. 1 165 319 in amended form.

In the decision under appeal, it was held that the grounds of opposition submitted by the appellant did not prejudice the maintenance of the patent as amended.

- II. Oral Proceedings were held before the Board of Appeal on 12 July 2007.

- III. The appellant requested that the decision under appeal be set aside and that the European Patent No. 1 165 319 be revoked.

The respondent (patentee) requested that the decision under appeal be set aside and the patent be maintained as granted or, as first auxiliary request, that the appeal be dismissed or as further auxiliary requests II to VIII, that the decision under appeal be set aside and the patent be maintained on the basis of the sets of claims filed as auxiliary requests II to VIII on 30 October 2006 in descending order of preference.

- IV. Claim 1 of the main request (as granted) reads as follows:

"1. A single-pass ink jet printing head comprising an array of ink jet outlets sufficient to cover a target width of a print substrate at a predetermined resolution, and

orifice plates, each of the orifice plates having orifices, each of the orifice plates serving some but not all of the area to be printed,

the orifices being arranged in a pattern such that adjacent parallel lines on the print medium are served by orifices that have different positions in the array along the direction of the print lines, that are separated by a distance that is at least an order of magnitude greater than the distance between adjacent orifices in a direction perpendicular to the print-line direction."

Claim 1 of the first auxiliary request (as maintained by the Opposition Division) reads as follows:

"A single-pass piezoelectric ink jet printing head, the printing head comprising an array of ink jet outlets sufficient to cover a target width of a print substrate at a predetermined resolution, and orifice plates, each of the orifice plates having orifices, each of the orifice plates serving some but not all of the area to be printed, the orifices being arranged in a pattern such that adjacent parallel lines on the print medium are served by orifices that have different positions in the array along the direction of the print lines, and are separated along the direction of the print lines by a distance that is at least an order of magnitude greater than the distance between adjacent orifices in a direction perpendicular to the print-line direction."

Claim 1 of the second and third auxiliary requests reads as follows:

"In a single-pass piezoelectric ink jet printing head, the printing head comprising an array of ink jet outlets sufficient to cover a target width of a print substrate at a predetermined resolution, and orifice plates, each of the orifice plates having orifices, each of the orifice plates serving some but not all of the area to be printed, a method for avoiding or at least diminishing the disadvantageous effects of web weave and poor line merging characterised in that the orifices being arranged in a pattern such that adjacent parallel lines on the print medium are served by orifices that have different positions in the array along the direction of the print lines, and are separated along the direction of the print lines by a distance that is at least an order of magnitude greater than the distance between adjacent orifices in a direction perpendicular to the print line-direction."

Claim 1 of the fourth auxiliary request differs from claim 1 of the first auxiliary request in that the term "for printing on a moving web" is added after "piezoelectric ink jet printing head", in that the term "a target width of a print substrate" is replaced by "a target width of the web", in that the term "each of the orifice plates being associated with a print-head module that prints a swath along the web, the swath being narrower than the target width" is added after "each of the orifice plates serving some but not all of the area to be printed", and in that the term "on the print medium" is replaced by "on the web".

Claim 1 of the fifth auxiliary request differs from claim 1 of the first auxiliary request in that the

terms "piezoelectric" and "along the direction of the print lines" (second occurrence) are omitted, and the term "and wherein the distance along the print line direction differs for different pairs of adjacent orifices across the substrate" is introduced at the end of the claim.

Claim 1 of the sixth auxiliary request differs from claim 1 of the first auxiliary request in that the term "but no more than two orders of magnitude greater than" is introduced after the term "a distance that is at least an order of magnitude greater than".

Claim 1 of the seventh auxiliary request differs from claim 1 of the first auxiliary request in that the term "and wherein the ratio between the largest distance between adjacent orifices in the print-line direction and the smallest distance between adjacent orifices in the print-line direction is no greater than 1.67:1" is added at the end of the claim.

Claim 1 of the eighth auxiliary request reads as follows:

"1. A single-pass piezoelectric ink jet printing head, the printing head comprising an array of ink jet outlets sufficient to cover a target width of a print substrate at a predetermined resolution, and orifice plates, each of the orifice plates serving some but not all of the area to be printed, the orifices of each plate being arranged in a pattern such that adjacent parallel lines on the print medium are served by orifices that have different positions in the pattern of the respective plate along the direction of the

print lines, and are separated along the direction of the print lines by a distance that is at least an order of magnitude greater than the distance between adjacent orifices in a direction perpendicular to the print-line direction."

V. The following documents were referred to in the appeal proceedings:

D1: EP-A-0 339 926

D1': EP-A-0 277 703

D2: EP-A-0 278 590

D3: JP-A-4-341856

D4: US-A-5,696,544

D5: US-A-5,469,199

D6: US-A-4,520,373

D7: US-A-5,771,052

VI. The appellant's arguments in the written and oral proceedings can be summarised as follows:

Documents D1' and D7 are both highly relevant. The amendment of the claim maintained by the Opposition Division necessitated the filing of document D7. These documents should therefore be admitted into the proceedings.

Claim 1 of the main request offends against the principle forbidding *reformatio in peius*.

Claim 1 of the first auxiliary request lacks novelty in view of the disclosure of document D1 taken in conjunction with documents D1' and D2, to which document D1 refers. The aspect ratio of 30, as

disclosed in document D2 at page 4, lines 8 to 10 and 36 to 38, inevitably results in a printhead falling within the terms of claim 1 of the first auxiliary request.

As regards the feature introduced into claim 1 of the second and third auxiliary requests, whilst the disadvantageous effects of web weave are allegedly diminished, in fact, the claim does not specify any features to this end. In addition, whilst a time delay between formation of adjacent drops may improve line merging, this effect depends on a number of unspecified factors, including web speed, ink viscosity, and substrate absorbency.

The subject-matter of claim 1 of the second and third auxiliary requests is thus not clear.

Claim 1 of the fourth auxiliary request is not new. The modules shown in Figure 2 of document D1 print swaths as required by the claim.

The amendments of claim 1 of the fifth auxiliary request offend against the principle forbidding *reformatio in peius*. It is no longer specified that the distance between orifices serving adjacent print lines is measured in the direction of the print lines. Arrangements which would not have fallen under claim 1 as maintained in the decision under appeal would fall under the amended claim.

The disclosure in the application as filed at page 9, lines 23 to 27, relates to a specific embodiment, and does not disclose a value of exactly two, but almost

two. The amendments to claim 1 of the sixth auxiliary request thus do not satisfy the requirements of Article 123(2) EPC.

There is no indication in the application as filed that the ratio of 1.67 disclosed at page 10, line 1, should be understood as being an upper limit or that the ratio is generally applicable. The amendments to claim 1 of the seventh auxiliary request thus do not satisfy the requirements of Article 123(2) EPC.

As regards the subject-matter of claim 1 of the eighth auxiliary request, document D7 represents the closest prior art. At column 3, lines 28 to 33, it is indicated that the use of a single plate is merely preferable. At column 6, line 1, it is indicated that the width of the print head is approximately 10 inches. If a wider print image were required, it would be obvious to place two printheads side by side, thus resulting in a printhead falling within the terms of claim 1.

The printheads of documents D1, D4, D5 and D6 all use multiple orifice plates. The decision as to how many orifice plates to use is a trivial choice relating to manufacturing convenience.

VII. The respondent's arguments in the written and oral proceedings can be summarised as follows:

Document D1' should not have been admitted into the proceedings by the Opposition Division. The Opponent's case should be made in the notice of opposition.

Document D7 was late filed and should also not be admitted into the proceedings. The document had been

cited in the search report. Claim 1 as maintained in the decision under appeal does not involve any significant changes.

The main request should be admitted in view of the introduction of document D1' into the proceedings.

It is not permissible to read the disclosures of documents D1, D1' and D2 together in order to destroy the novelty of claim 1. There is no disclosure of the ratio specified in claim 1. In view of the teaching in document D2 at page 2, lines 37 to 48, the skilled person would use the aspect ratio of 3 rather than 30.

The subject-matter of claim 1 of the first auxiliary request is thus novel.

As regards claim 1 of the second and third auxiliary requests, the specified aim is achieved by the arrangement of the orifices as set out in the characterising portion of the claim.

The decisions in G 2/88 and G 6/88 apply to physical entities and devices in general. The claim relates to a new use of the printing head in order to avoid the disadvantages of the prior art. This thus results in a new technical effect. Such a claim is novel, even if the technical effect was inherently present in the prior art.

Claim 1 of the second and third auxiliary requests is thus clear.

Document D1 does not disclose the features of orifice spacing as specified in claim 1 of the fourth auxiliary request. The claim is thus new.

The amendments of claim 1 of the fifth auxiliary request do not offend against the principle forbidding *reformatio in peius*. The reference in the claim to a distance clearly refers to the distance as measured in the direction of the print lines.

The application as filed discloses the feature specifying that the separation of the orifices is no more than two orders of magnitude at page 9, lines 23 to 27. The use of the term "almost" indicates that two orders of magnitude is an upper limit. The amendments to claim 1 of the sixth auxiliary request thus satisfy the requirements of Article 123(2) EPC.

The ratio specified in claim 1 of the seventh auxiliary request is disclosed in the application as filed at page 10, lines 1 and 2. There is a general teaching that the ratio should be small, so that the disclosed ratio of 1.67 should be understood as being an upper limit.

As regards the subject-matter of claim 1 of the eighth auxiliary request, document D7 represents the closest prior art.

The problem to be solved is that of minimising the effects of web weave and poor line merging. None of the cited prior art mentions this problem, so that there is no motivation for the person skilled in the art to modify the printhead of document D7 by the use of

multiple orifice plates. Even if the orifice plate of document D7 were to be split up to form a plurality of orifice plates, this would not necessarily result in the arrangement of orifices specified in claim 1.

Reasons for the Decision

1. *Late filing of documents*

1.1 Document D1'

Document D1' was introduced into the opposition proceedings by the Opposition Division. This document is referred to in document D1 at page 3, lines 16 to 20, as showing a module for use in the printhead of document D1.

In view of the relevance of document D1' to the decision under appeal, the Opposition Division correctly exercised their discretion in introducing this document into the proceedings.

1.2 Document D7

Document D7 was not considered in the proceedings before the Opposition Division and was introduced into the present proceedings with the statement of grounds of appeal.

In the decision under appeal, the patent in suit was maintained in amended form, claim 1 having been amended so as to make clear an otherwise unclear feature concerning the separation of the orifices.

The disclosure of document D7 is relevant to this feature. During the course of the appeal proceedings, the respondent had ample time to consider this document. The Board accordingly considers it appropriate to exercise their discretion and admit document D7 into the present proceedings.

2. *Main Request*

2.1 Amendments

The opponent is the sole appellant against an interlocutory decision maintaining a patent in amended form. The patent proprietor is primarily restricted during the appeal proceedings to defending the patent in the form in which it was maintained by the Opposition Division in its interlocutory decision (cf. decision G 9/92 (OJ EPO 1994, 875); point 16 of the Reasons). Amendments proposed by the patent proprietor as a party to the proceedings as of right under Article 107 EPC, second sentence, may be rejected as inadmissible by the Board of Appeal if they are neither appropriate nor necessary (decision G 9/92; point 16 of the Reasons).

The reference to the ink jet printing head being a piezoelectric ink jet printing head, and the expression "along the direction of the print lines", which qualifies the distance of separation of the orifices in claim 1 as maintained in the decision under appeal, are omitted from claim 1. The omission of these features allows the claim to cover print heads and

arrangements of the orifices that would not be covered by claim 1 as maintained in the decision under appeal.

The omission of these features thus gives rise to a *reformatio in peius* to the disadvantage of the appellant. In the Board's judgement, these amendments are therefore neither appropriate nor necessary and the request has to be rejected as inadmissible.

3. *First Auxiliary Request*

3.1 Novelty

Document D1 discloses, with particular reference to Figure 2(a), (b) and (c), a printhead comprising layers of modules grouped in stacks. As stated at page 3, lines 16 to 20, the modules may be those of document D1' or D2. The disclosure of document D1 must thus be read in conjunction with that of documents D1' and D2 as regards the construction of the modules.

Document D2 discloses, with particular reference to Figure 1(a), (b) and (c), such a module having rectangular ink channels, the longer edge of the channels extending normal to the plane containing the channel axes (page 4, lines 6 to 8). As disclosed at page 4, lines 8 to 10, the aspect ratio of the channels is "typically 3 to 30". In addition, it is disclosed at page 4, lines 36 to 38, that the aspect ratio of the actuator wall, that is, the wall separating the channels, is "typically 3-30 or more".

The use of an aspect ratio for the channels and actuator walls of 30 inevitably results in the orifices being arranged in a pattern such that adjacent parallel lines on the print medium are served by orifices that have different positions in the array along the direction of the print lines, and are separated along the direction of the print lines by a distance that is at least an order of magnitude greater than the distance between adjacent orifices in a direction perpendicular to the print-line direction.

It was argued on behalf of the respondent that the teaching in document D2 at page 1, lines 37 to 43, encourages the person skilled in the art to reduce the distance between the rows of modules. In the light of this teaching, the aspect ratio of 3, rather than 30, would be selected. This cannot be accepted in the context of the consideration of the question of novelty. Document D2 provides a clear teaching of an aspect ratio of 30 and indicates at page 4, lines 5 and 6, that this feature enables a high density of packing of the ink channels. There is thus no reason for the skilled reader of document D2 to ignore this disclosure.

The subject-matter of claim 1 thus lacks novelty in view of the disclosure of document D1 read in conjunction with that of document D2.

4. *Second and Third Auxiliary Requests*

4.1 Clarity

Claim 1 (both requests) is directed to "a method for avoiding or at least diminishing the disadvantageous

effects of web weave and poor line merging". As explained in paragraph [0020] of the patent in suit, the effects of web weave can be reduced by minimizing the spacing along the direction of the print lines between orifices serving adjacent print lines. The effects of poor line merging, however, may be mitigated by allowing as much time as possible to pass between drop formation of adjacent print lines (see paragraph [0027] and Figure 5 of the patent in suit).

Whilst claim 1 specifies a minimum value for the distance between adjacent orifices in a direction perpendicular to the print line-direction, no upper limit is specified. Thus, whilst the features of the claim may be regarded as potentially addressing the problem of poor line merging, the claim does not specify any technical features which would contribute to a solution to the problem of poor drop placement resulting from web weave.

In addition, the effect of poor line merging, as discussed in the patent in suit in paragraphs [0022] to [0024], is not only dependant upon orifice spacing, but also, for example, web speed, absorbency of the substrate and ink viscosity.

It was suggested on behalf of the respondent that decisions G 2/88 and G 6/88 of the Enlarged Board of Appeal are applicable to claim 1. In decision G 6/88, the question referred to the Enlarged Board was answered as follows: "a claim to the use of a known compound for a particular purpose, which is based on a technical effect which is described in the patent, should be interpreted as including that technical

effect as a functional technical feature, and is accordingly not open to objection under Article 54(1) EPC provided that such technical feature has not previously been made available to the public".

These decisions do not, however, apply in the present case. Claim 1 fails to specify a "particular purpose, which is based on a technical effect" and merely refers to the alleged advantage of "avoiding or at least diminishing the disadvantageous effects of web weave and poor line merging". In fact, the purpose of the claimed use is forming a printed image, which is not distinguishable from the purpose of the prior art.

Claim 1 thus fails to specify the technical features of the method which are essential for solving the technical problem with which the patent in suit is concerned. The requirements of Article 84 EPC are thus not satisfied.

5. *Fourth Auxiliary Request*

5.1 Novelty

As shown in, for example, Figure 2(a) of document D1, each of the orifice plates is associated with a print-head module that prints a swath along the web, the swath being narrower than the target width. In addition, the printhead of document D1 is intended for printing on a moving web (see page 2, line 2), and is piezoelectrically actuated (see page 3, line 16).

The features which distinguish claim 1 from claim 1 of the first auxiliary request are thus also known from document D1, so that the subject-matter of the claim lacks novelty.

6. *Fifth Auxiliary Request*

6.1 As compared with claim 1 as maintained in the decision under appeal, claim 1 omits, *inter alia*, the wording "along the direction of the print lines" (second occurrence). Thus, claim 1 as maintained in the decision under appeal specifies the distance between orifices serving adjacent print lines in terms of the distance as measured along the direction of the print lines. However, claim 1 of the present request does not specify how this distance is to be measured, so that it must be assumed that it is the actual distance between the orifices that is intended.

Orifices serving adjacent parallel lines that are separated along the direction of the print lines by a distance that is somewhat less than an order of magnitude greater than the distance between adjacent orifices in a direction perpendicular to the print-line direction may, nevertheless, be separated by a distance (measured directly) that is at least an order of magnitude greater than the distance between adjacent orifices in a direction perpendicular to the print-line direction.

Thus, printheads which would not fall under claim 1 as maintained in the decision under appeal may fall under claim 1 of the present request.

The omission of this wording thus gives rise to a *reformatio in peius* to the disadvantage of the appellant. This amendment therefore has to be rejected as inadmissible.

7. *Sixth Auxiliary Request*

7.1 Amendments

Claim 1 is amended to specify that adjacent parallel lines on the print medium are served by orifices that are separated along the direction of the print lines by a distance that is no more than two orders of magnitude greater than the distance between adjacent orifices in a direction perpendicular to the print-line direction.

In the application as filed, there is a disclosure in the paragraph bridging pages 9 and 10 that, "in the example of figures 10 through 12, the distance along the web direction ... is between 1.2 and 2.0 inches for every adjacent pair of printing line orifices (which is more than an order of magnitude and almost two orders of magnitude larger than the orifice spacing - 1/50 inch - in a given array module)". There is, however, no disclosure to the effect that a ratio of two orders of magnitude may constitute an upper limit or that such a ratio is applicable to printing heads other than that with which this paragraph is concerned.

The amendment thus does not satisfy the requirements of Article 123(2) EPC.

8. *Seventh Auxiliary Request*

8.1 Amendments

Claim 1 is amended to specify that the ratio between the largest distance between adjacent orifices in the print-line direction and the smallest distance between adjacent orifices in the print-line direction is no greater than 1.67:1.

In the application as filed, there is a disclosure in the paragraph bridging pages 9 and 10 that, "in the case of figures 11 and 12, the ratio is 1.67". There is, however, no indication that this ratio may constitute an upper limit or that such a ratio is applicable to printing heads other than that with which this paragraph is concerned.

The amendment thus does not satisfy the requirements of Article 123(2) EPC.

9. *Eighth Auxiliary Request*

9.1 Inventive Step

9.1.1 Closest Prior Art

Document D7 discloses, with particular reference to the embodiment of Figures 3 and 4, a first embodiment of a single-pass piezoelectric ink jet printing head 10, the printing head comprising an array of ink jet outlets sufficient to cover a target width of a print substrate at a predetermined resolution, and an orifice plate 90, the orifices of which are arranged in a pattern such

that adjacent parallel lines on the print medium are served by orifices that have different positions in the pattern along the direction of the print lines (see column 4, lines 35 to 42).

Figures 6 and 7 of document D7, as mentioned at column 5, lines 61 to 64, show a printhead comprising modules arranged as in the first embodiment. The orifices serving adjacent print lines are separated along the direction of the print lines by about 0.34 to 0.4 inch (column 6, line 39). Adjacent orifices in a direction perpendicular to the print-line direction are separated by about 0.020 inch (column 5, lines 63 and 64). The ratio between these dimensions as specified in claim 1 is thus greater than an order of magnitude.

As disclosed at column 6, line 1 of document D7, a print image of about 10 1/4 inches may be produced using the embodiment of Figures 6 and 7.

The subject-matter of claim 1 is distinguished over the disclosure of this document solely in that the printhead comprises a plurality of orifice plates, each of the orifice plates serving some but not all of the area to be printed.

9.1.2 Problem to be Solved

It was suggested on behalf of the respondent that the problem to be solved may be regarded as being to overcome the disadvantages resulting from web weave and poor line merging. However, this problem is not addressed by the use of multiple orifice plates.

The problem to be solved may be regarded as being to enable single pass printing of print images having a greater width.

9.1.3 Solution

This problem can be solved by either increasing the width of the printing head or by arranging two or more of the printheads as known from document D5 side by side. The choice between these two alternatives is a trivial matter depending on manufacturing considerations. The use of two or more of the known printing heads side by side would result in a printing head comprising a plurality of orifice plates, each of the orifice plates serving some but not all of the area to be printed.

The subject-matter of claim 1 thus does not involve an inventive step within the meaning of Article 56 EPC.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

E. Görgmaier

W. Zellhuber