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**D E C I S I O N**  
**of 18 December 1997**

**Case Number:** T 0730/97 - 3.5.1

**Application Number:** 92309294.4

**Publication Number:** 0540207

**IPC:** H04N 1/12

**Language of the proceedings:** EN

**Title of invention:**  
Printing method and apparatus

**Patentee:**  
Nur Advanced Technologies Ltd

**Opponent:**  
-

**Headword:**  
Square pixels/NUR

**Relevant legal provisions:**  
EPC Art. 56

**Keyword:**  
"Inventive step (no)"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 0730/97 - 3.5.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.5.1  
of 18 December 1997

**Appellant:**

Nur Advanced Technologies Ltd  
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**Representative:**

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**Decision under appeal:**

Decision of the Examining Division of the  
European Patent Office posted 13 February 1997  
refusing European patent application  
No. 92 309 294.4 pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** P. K. J. van den Berg

**Members:** R. Randes  
V. Di Cerbo

## Summary of Facts and Submissions

I. This appeal is against the decision of the examining division, dated 13 February 1997, to refuse the application according to the state of the file for the reasons set out in its communication of 21 January 1997. These reasons were that the subject-matter of claim 1 was not clear and not supported by the description (Article 84 EPC) and the subject-matter of claims 1 to 8 lacked an inventive step (Articles 52(1) and 56 EPC). The following document was cited in the communication:

D7: EP-A-0 036 787

II. The appellant (applicant) lodged an appeal against the decision on 19 March 1997 and paid the prescribed fee on 25 March 1997. On 19 June 1997 a statement of grounds of appeal was filed, in which the appellant requested that the decision under appeal be set aside and a patent granted on the basis of claims 1 to 8 filed with the grounds of appeal. A request for oral proceedings was also filed.

III. The Board issued a communication expressing the preliminary opinion that the subject-matter of claims 1 and 4 was not supported by the description and lacked an inventive step. The Board relied, in particular, on the following document, taken from the examining proceedings:

D9: GB-A-1 432 366

IV. In the response, the appellant withdrew the request for oral proceedings and requested a decision according to the state of the file. No further arguments were given.

V. Accordingly, the appellant did not appear in the oral proceedings which had been appointed for 18 December 1997.

VI. Claim 1 of the main request reads as follows:

"Apparatus for continuously printing on a continuous print substrate (13) in sheet form, comprising means for supporting and continuously feeding a continuous sheet of print substrate (13) past at least one printing station, said station comprising a plurality of ink jet printing nozzles (42) of the electrostatic, drop deviation type mounted with their axial planes perpendicular to the direction of the print substrate (13) feed motion, means for ejecting printing inks or dyes in the form of drops from each of said printing nozzles (42) towards the print substrate (13) and deviating said drops, when so desired, so as to deposit them on the print substrate (13) at positions spaced perpendicularly to the direction of the print substrate (13) feed motion and comprised within a maximum deviation (d), said printing nozzles (42) being mounted in such a positioned relationship to the print substrate (13) and to one another that they cover the entire width of the print substrate (13), characterized in that it further comprises

means for controlling the speed of the print substrate (13) feed motion, so that the print substrate (13) will be displaced along the direction of feed, in a period of time required for the ejection of a number of drops equal to the number (n) of different drop positions comprised in said maximum deviation (d), by a distance not substantially smaller than said maximum deviation (d) divided by said number (n), whereby to print pixels having a width substantially equal to said maximum deviation (d) and a length not substantially smaller than said width and consisting of substantially square or longitudinally elongated cells."

Independent method claim 4 corresponds to apparatus claim 1.

VII. The appellant argued as follows:

The application concerned the problem of improving printing of non-repetitive patterns at high speed on a continuous print substrate such as textile fabric. The invention solved this problem by using an ink jet printer in which the ink drops were formed into pixels. A pixel was the smallest area of print that was optically significant. Thus the printing speed could be increased by controlling the number of drops, or the "grey value", of the pixels. The invention also achieved an optimum print speed and quality by printing square or longitudinally (in the direction of feed) elongated cells. This was achieved by controlling the speed of the substrate feed in relation to the ejection of the ink drops.

Document D9, which was the closest prior art, disclosed

a similar ink jet printer. In D9 the geometrical arrangement and the electrical operating parameters of the printing gun were chosen so that the ink drops formed continuous spots along lines on the printing substrate. Neither D9, nor any other prior art document, disclosed however the concept of pixels or means to control the shape of these pixels.

### **Reasons for the Decision**

1. The appeal is admissible.
2. *The application*
  - 2.2 The printer in Figure 3 of the application has a line of ink jet printing heads 31-35 of the electrostatic drop deviation type mounted in a line across the direction of travel of the continuous substrate 13. These heads eject drops of ink which are charged and then deflected by an electric field. Each head can deposit drops of ink in a number of positions  $n$  over a maximum deviation  $d$  along a single line. In the example of Figure 4, each head can deposit a dot of ink in one of ten positions. The dots (cells) are arranged in square pixels of ten by ten dots.
  - 2.2 The application states at page 12, lines 17 to 19 that, in order to obtain square pixels, the speed of the substrate feed must be coordinated with the speed of the ink drop ejection. If the pixel is to be square, each cell must be square and so its width must equal

its length. The width of a pixel is the maximum deviation of a head  $d$  and it contains  $n$  (10 in the example of Figure 4) drop positions. The width of each cell in the pixel is thus  $d/n$ . The length of the cell is determined by the speed of the substrate feed  $V$  multiplied by the time taken by the head to eject the number of drops in one line, referred to as the period of the head  $p$ , namely  $V \times p$ . Thus, for square pixels  $d/n = V \times p$ , or  $V = d/n \times p$ , as stated at page 13, line 13.

### 3. *Amendments*

3.1 The Board agrees with the appellant's comments at paragraphs 3.2 and 3.3 in the grounds of appeal that the description envisages a substrate feed speed higher than that required for square pixels. This produces longitudinally (in the direction of feed) elongated cells.

3.2 The Board is accordingly satisfied that the amendment to claim 1 to include the alternative that the printed pixels consist of "longitudinally elongated" cells does not contravene Article 123 EPC.

### 4. *Clarity and interpretation*

4.1 In the opinion of the Board the expressions, in claim 1, "a distance not substantially smaller" and "a length not substantially smaller" do not clearly define the required longitudinally elongated pixels. The expressions could mean, for example, that the length of

the resulting pixel is smaller than the width. In this case the pixel would be elongated in the transverse direction (perpendicular to the direction of feed), an interpretation which would be at odds with the appellant's explanation at paragraph 3.3 of the grounds of appeal.

4.2 Since, however, the claim defines that this length produces substantially square or longitudinally elongated cells, the Board interprets the expressions in the sense that the distance or length is either not smaller than or substantially the same as the deviation or width, respectively.

5. *Inventive Step*

5.1 It is common ground that D9 represents the closest prior art and that it discloses the features of the preamble of claim 1. D9 also discloses an arrangement of square cells. In the example given in D9 (page 3, lines 113 to 120) there are 4000 printing points across the one metre width and sixteen million drops per square metre. This implies that the cells are square. Although the printed dots are said to form a continuous pattern, this does not affect the fact that the characteristic dimension in each direction of the dot is the same.

5.2 This example also discloses the claimed relationship between feed speed and ink drop ejection. Each nozzle can deposit drops in any number of sixteen positions (page 3, lines 124 to 126) so that, in the terminology of the present application,  $n$  equals 16. The sixteen

drops are 4 mm wide so that the maximum deviation  $d$  equals  $4/1000$  metres. The jet vibrates at 64,000 cycles per second (page 3, line 112) so that sixteen drops require a time of  $16/64000$  seconds. In this case, in order to produce square pixels, the alleged invention would require a feed speed of  $d/n \times p$  which is  $4/1000/(16 \times 16/64000)$  or 1 metre per second. This is the feed speed disclosed in the example in D9 (page 3, line 117). Thus the means for setting the feed speed to obtain square cells falls within the scope of claim 1.

5.3 The Board is therefore of the opinion that claim 1 differs from D9 only in that the cells form square pixels having a dimension substantially equal to the maximum deviation ( $d$ ) of the print head. However, the use of pixels is a common measure in the field of image processing and printing techniques, in particular. Thus faced with the array of square cells disclosed in D9, the skilled person would consider grouping the dots into appropriately sized pixels. Square pixels are an obvious choice, since it is not unusual to require the same resolution in both directions of a printed image. It would be an obvious measure to associate each pixel with the output of a single print head, since this represents a natural grouping of dots and has a suitable dimension (4 mm). This yields pixels with a width equal to the maximum deviation of the head. The Board is therefore of the opinion that the subject-matter of the first alternative of claim 1 concerning square cells is obvious to the skilled person and does not involve an inventive step.

5.4 Since the subject-matter of the first alternative of claim 1 does not involve an inventive step, claim 1 is not allowable (Article 56 EPC).

6. There being no other requests, it follows that the appeal must be dismissed.

### **Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar: The Chairman:

M. Beer

P. K. J. van den Berg