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D E C I S I O N
of 3 March 2000

Case Number: T 0501/96 - 3.5.1

Application Number: 87301187.8

Publication Number: 0234809

IPC: H04N 1/40

Language of the proceedings: EN

Title of invention:
Image processing apparatus

Applicant:
CANON KABUSHIKI KAISHA

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 52(1), 54, 56, 82, 84, 111(1), 123(2)
EPC R. 86(3)

Keyword:
"Search Report: non-unity, three inventions"
"No additional search fees paid"
"Examining Division refuses second invention, lack of inventive step"
"Board: unity between first and second invention"
"Second invention: inventive step (yes)"

Decisions cited:
-

Catchword:

-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0501/96 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 3 March 2000

Appellant: CANON KABUSHIKI KAISHA
30-2, 3-chome, Shimomaruko
Ohta-ku
Tokyo (JP)

Representative: Beresford, Keith Denis Lewis
BERESFORD & CO.
2-5 Warwick Court
High Holborn
London WC1R 5DJ (GB)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 30 October 1995 refusing European patent application No. 87 301 187.8 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: P. K. J. van den Berg
Members: R. Randes
S. Perryman

Summary of Facts and Submissions

I. European patent application No. 87 301 187.8, claiming priority from three applications of Japan of 14 February, of 6 March and of 4 April 1986, was refused by a first decision of the examining division dated 19 April 1991.

The reason for refusal was that the subject-matter of claim 1 then on file lacked novelty (Article 54 EPC) having regard to the teaching of document D1 (EP-A-0 024 902).

II. The applicants (appellants) lodged an appeal against this decision and filed a statement of grounds of appeal. The Board considering that appeal set aside the examining division's decision, because of a substantial procedural violation and remitted the case to the examining division for further prosecution. It was also pointed out that the examining division had apparently not finally decided upon the lack of unity objection of the Partial European Search Report, dated 9 November 1988.

III. Following further submissions by the appellants and communications from the examining division, oral proceedings were held on 16 October 1995, at the end of which the examining division again refused the application, on the grounds that the claim 1 submitted during those oral proceedings and reading:

"Apparatus for generating signals for subsequent image formation comprising:

processing means (109, 113) for receiving m-bit image data and converting the m-bit image data into n-bit image data, where n is > m;

conversion means (113) connected to the output of the processing means and adapted to carry out density conversion on said n-bit data so as to match the gradation characteristic of the image data to that of the image forming means; and

output means (104a) for supplying the density converted data from the conversion means to image forming means; and characterised in that

said conversion means comprises a plurality of different look-up tables (a,b,...d) each of which can be utilized to carry out density conversion of an n-bit image data signal received from the processing means, and means (120) for selecting any one of the plurality of look-up tables so that density conversions carried out by the selected look-up table on the n-bit image can be matched to a particular type of image recording means".

lacked an inventive step (Article 56 EPC) having regard to the teaching of D1. The written decision to this effect was posted on 30 October 1995.

IV. On 2 January 1996, the applicants lodged an appeal against the decision of 30 October 1995 of the examining division and paid the appeal fee. On 6 March 1996 they filed a statement of grounds.

V. After a reply of the appellants to a first

communication, the Board in a second communication stated that an additional search requested by the Board, had to be carried out. This was because the Board preliminarily considered that the subject-matter of claim 1 was not obvious over the prior art of D1, contrary to the opinion of the examining division expressed in the appealed decision. The subject-matter now contained in claim 1, however, appeared to correspond to the second invention according to the Partial European Search Report, which had not been searched (only the first invention of three had been searched). It was said in the communication that, since the Board had concluded that, by implication, the examining division was of the opinion that unity existed between the two first inventions identified in the said search report, and since the Board by an investigation of its own also had arrived at the same result, the Board could see no point in remitting the case back to the examining division, since the examining division had considered that the subject-matter of claim 1 lacked an inventive step already having regard to the teaching of D1 only.

VI. After having received the additional search report, indicating additional documents,

A1: DE-A-3 409 771,

A2: Journal of Applied Photographic Engineering, Vol. 7, No. 4, August 1981, Rochester (US), XP 2010718, Yuh-Juh Juang: "Design considerations for an Intelligent High-Speed Image-Scanning/Recording System", and

A3: EP-A-0 083 176,

the Board in a communication, dated 16 October 1997, expressed its preliminary opinion, which can briefly be summarized as being that starting from the teaching of D1, the problem to be solved could be considered to be avoiding the variation of reproduced images using the output of D1 for different recording means. The solution claimed in the claim 1 then put forward would be derived in a straightforward way from the documents A1 to A3. A1 disclosed the idea of compensating for the characteristics of different and separate input devices, and such compensation was apparently obviously transferable to different output devices. From A2 and A3 the use of look-up tables for correction of images on different media was known. The invention claimed thus appeared to be obvious.

VII. With a letter of 24 June 1998 the appellants filed a new set of claims 1 to 4. Claim 1 had according to the appellants been revised in the interest of clarity and had been properly delimited against the prior art of D1 to emphasise the difference between the invention and the prior art. It reads as follows:

"An image processing apparatus, comprising:

processing means (109) for receiving image data and processing the image data for output to image forming means; and

image forming means (240, 241) for forming an image on the basis of the image data processed by said processing means;

characterised by said processing means being adapted to receive m-bit image data and to convert the m-bit image data into n-bit image data where n is > m; and further comprising

conversion means (113) connected to the output of the processing means and adapted to carry out density conversion on said n-bit data so as to match the gradation characteristic of the image data to that of the image forming means;

said conversion means comprising a plurality of different look-up tables (a,b,...d) each of which can be utilized to carry out density conversion of an n-bit image data signal received from said processing means, and means (120) for selecting any one of the plurality of look-up tables so that density conversions carried out by the selected look-up table on the n-bit image can be matched to a particular type of image forming means".

VIII. The argumentation of the appellants can be summarized as follows:

The present invention is concerned with processing data information for printers. The problem to which the present invention is related is that input data which has been processed for printing in one manner will not necessarily be capable of always providing the best possible result when supplied, for example, to another type of printer.

Despite there being substantial prior art concerning the matching of colour gamuts of input and output

devices, the appellants were not aware of anyone previously appreciating the problem of matching density conversion characteristics between a signal processor and image forming means of the type with which the present invention was concerned. The subject matter of the claim 1 now filed represented an extremely simple and elegant solution.

The solution proposed in the present application is in particular to use a plurality of look-up tables (LUTs), each of them carrying out a different range of density conversions on input data.

The apparatus according to D1 operates in a totally different way and for totally different reasons; there is no hint therein to the problem of the present invention. The additional documents cited by the Board also relate to problems and solutions totally different to the present invention. Thus A2 and A3 both relate to reproduction of digital data on photographic material. A1 is concerned with the manipulation of colour signals by matrix conversions and does not suggest that the apparatus disclosed therein might be used with a plurality of different output devices having different density characteristics.

IX. The appellant, thus, requested that

- the decision under appeal be set aside and

- the patent be granted on the basis of the claims 1 to 4 filed on 24 June 1998 (cf. under VII above), description pages 1, 6 to 9, 16 to 20, 28 and 29 filed with the statement of grounds of appeal on

6 September 1996 and description pages 2 to 5, 10 to 15 and 21 to 27 as originally filed and, moreover, drawing sheets 1 to 9 as originally filed.

Moreover, auxiliarily oral proceedings were requested.

Reasons for the Decision

1. The appeal is admissible.

2. The modified claim 1 now put forward has a basis in the application as originally filed, in particular in the description on original pages 20 to 27 referring to the (then) third embodiment. The claim thus satisfies the requirements of Article 123(2) EPC.

3. Claim 1 has been rephrased to provide a proper delimitation over the teaching of D1, and meets the requirements of clarity and conciseness of Article 84 EPC.

4. The Board has not made an exhaustive examination of the new dependent claims, nor of the description as to consistency with present claim 1. Nevertheless as the critical issue in the decision under appeal was inventive step as regards the main claim, the Board pursuant to its powers under Article 111(1) EPC exercises the discretion given by Rule 86(3) EPC to allow the amended set of claims into the proceedings.

5. None of the documents cited as prior art during the prosecution of the application, including the documents

revealed by the additional search (see point VI above) shows all the features of claim 1, so that novelty can be acknowledged.

6. Throughout the proceedings, before the examining division as well as before the Board, document D1 has been considered to disclose the closest prior art.

This document discloses the conversion of 1-bit data to 6-bit image data thereby using an area integration method. In parallel to the area integration means, there is an edge extraction means, the output of which is added by an adder to the output of the area integration means. The edge extraction means adds a component of 5-bit data to the 6-bit image data from the area integration means. The edges are emphasised, since the averaging tends to wash them out. The resulting data may be thresholded, screened or used directly in any printing process. The edge extraction is quite complicated and all arithmetic, including square roots, is done using ROMs. There are various indications in the text that the ROMs may be look-up tables and that they carry out conversions to improve the output.

Having regard to the design of the apparatus as disclosed in D1, the Board is of the opinion that the delimitation of claim 1 against the teaching of D1 has been correctly made. Thus, D1 discloses a processing means (area integration means in parallel with edge extraction means) and mentions that an image forming means can be added at the output of said processing means. However, the features after the word "characterised by" in claim 1, whether taken separately

or in combination, are not disclosed by D1.

7. According to the characterizing part of claim 1 the said processing means converting m-bit image data to n-bit data (n>m) is connected in series to the image forming means via a conversion means. This conversion means is thus "connected to the output of the processing means and adapted to carry out the density conversion on said n-bit data so as to match the gradation characteristic of the image data to that of the image forming means".

In the view of the Board the spatial filtering of D1 together with edge enhancement does not match the gradation characteristic of the image data to that of any image forming means but rather refers to a mapping of grey scales as was put forward by the appellants in the oral proceedings of 16 October 1995 before the examining division.

However, it would appear that D1 does indeed disclose the concept of using look-up table values in order to perform a density adjustment appropriate to the particular combination of input and output devices (D1, page 9, lines 19 to 22 and 27). It appears to the Board that a skilled person would infer that the ROMs of the edge extraction arrangement in D1 do function as look-up tables (LUTs), and not as performing calculations using algorithm. It would be clear to the skilled person that for example the square root value is obtained by looking up a value in a table (see element 33 of Figure 12 and page 8, lines 30 to 33). It is in the nature of a ROM that when an address is input, it returns the datum held at that address. It is merely a

matter of different terminology and not of technical substance whether one refers to the conversion means as being supplied with a ROM or a look-up table. However there is no suggestion that there should be available different look-up tables for use in relation to different image forming means.

While D1 does say that the PROMs can be programmed at any point in the design cycle (D1, page 9, lines 24 to 27), the Board does not agree with the assertion by the examining division that it would be a design alternative which the skilled man would "inevitably consider" to hold a plurality of LUTs appropriate for different output devices simultaneously in ROM and supply means for selecting between this plurality as part of the apparatus.

Having regard to the comparison between the invention and the apparatus disclosed in D1 above, it appears to the Board that the invention is not obvious over the prior art disclosed by D1. Instead of using a parallel edge enhancement branch of the processing means for manipulating the image data with the aid of ROMs, the invention uses a simple and separate post-processing stage for an exactly matching of the gradation characteristic of the image data to the image forming means. Although, the edge extraction arrangement of ROMs according to D1 could be seen to function like an arrangement of LUTs, the Board considers that the conversion means as identified in the last paragraph of claim 1 cannot in an obvious way be derived from D1. The applicant has realized that input data which has been processed for printing in one manner will not necessarily be capable of always providing the best

possible result when supplied, e.g. to another type of printer. By a simple selection (e.g. according to a manual switch as according to claim 2) and the use of one of a plurality of LUTs comprised in the conversion means the applicant has found a simple solution.

8. The intention of the Board with the communication of 16 October 1997 cited above was to show that it was common practice to use LUTs in conversion means carrying out different operations on image data. However, having regard to the reply by the appellants, these documents do not show that the present invention is obvious; rather they show that no one before the priority date of the present application had been concerned about the problem pointed out by the appellants.

Thus, A2 and A3 are concerned with the reproduction of digital data on photographic material. It is of course well known in the field of photography that photographic materials have widely varying linear characteristics and, therefore, have to be compensated for. There is nothing in these references that would lead a skilled person to consider providing digital LUTs by means of which density characteristics could be varied in accordance with the characteristics of an output device.

A1 is concerned with an image processing apparatus capable of receiving data from a range of input devices, e.g a colour TV camera, a colour scanner and a magnetic tape player, which have different spectral characteristics, but which apparatus has only one single output device. This apparatus produces images

which deviate in colour output when said different input devices are used. A1 teaches to provide an input selector switch 404 and an input correction device 405 providing a conversion matrix circuit, which functions as a colour correction circuit for correcting the input image data having regard to the spectral characteristics of the input device used. The correction device (conversion matrix) contains conversion tables which are selected by a table selector 406 in correspondence to the selected input device. The corrected RGB signals from the correction device are then processed by a chain of standard colour processing circuits. The apparatus also carries out gamma correction (by the aid of tables) under colour removal. The signals so processed reach a pattern generator 109 the output of which is supplied to a printer 110. As is pointed out by the applicants the said pattern generator may contain a dither matrix which, as is well known, is used for converting multi-level gradation signals into binary data suitable for output to a printer. The invention, however, starts from a dither matrix signal (cf. the present application, Figure 9, reference 110), the m-bit (1-bit) data of which is converted to n-bit (n>m) image data. Moreover, nowhere in A1 there is a hint of matching density conversion of image data signals to the requirements of different image forming means. This is, of course, understandable, since this document is concerned with a totally different stage of the image forming process. As a result the Board is convinced that the skilled man would not transfer the idea disclosed by A1, i.e. to compensate spectral characteristics of different input devices, to the problem solved by the invention.

9. The Board thus finds that, having regard to the prior art on file, the subject-matter of claim 1 meets the requirements of Articles 123(2) and 84 EPC as to fair basis and clarity, and the requirements of Article 52(1), 54 and 56 EPC as to novelty and inventive step.

10. Minor corrections and clarifications may be necessary in the description and the dependent claims, but these can conveniently be left to further prosecution before the examining division.

Thus, for example, it appears that of the new claims 2 to 4, filed before the Board, claim 4 is not clear, since "said output means" mentioned in the claim has no clear antecedent in the preceding claims.

The Board has also noted that on page 6 of the description document D1 has apparently been identified with a wrong number. Moreover, in the short description of the drawings, under Figure 11, a "second embodiment" of the invention and, under Figure 14 a "third embodiment" has been mentioned. However, it appears that the cited expressions may not be in accordance with the invention as claimed in the fresh set of claims.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance for further prosecution on the basis of the appellants' request (see under IX and VII) with particular attention being paid to correction of the deficiencies mentioned in paragraph 10 above and with the proviso that Claim 1 meets the requirements of the EPC having regard to the prior art on file.

The Registrar: The Chairman:

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