



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵ : H04N 1/40	A3	(11) International Publication Number: WO 91/17627 (43) International Publication Date: 14 November 1991 (14.11.91)
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(21) International Application Number: PCT/US91/03089

(22) International Filing Date: 6 May 1991 (06.05.91)

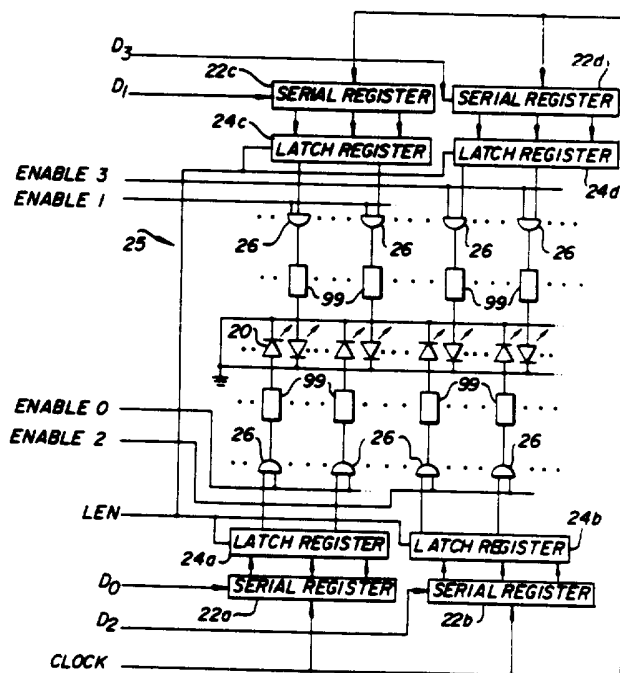
(30) Priority data:

521,511	10 May 1990 (10.05.90)	US
609,868	7 November 1990 (07.11.90)	US

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ter, NY 14650-2201 (US).(81) Designated States: AT (European patent), BE (European
patent), CH (European patent), DE (European patent),
DK (European patent), ES (European patent), FR (Eu-
ropean patent), GB (European patent), GR (European
patent), IT (European patent), JP, LU (European pa-
tent), NL (European patent), SE (European patent).**Published***With international search report.**Before the expiration of the time limit for amending the
claims and to be republished in the event of the receipt of
amendments.*(88) Date of publication of the international search report:
2 April 1992 (02.04.92)(54) Title: APPARATUS AND METHOD FOR GREY LEVEL PRINTING USING A BINARY ARCHITECTURED
PRINthead

(57) Abstract

A binary architected LED printhead (25, 125) is driven in accordance with a multiple addressable, i.e., multiple sublines of recording, scheme to record grey level pixels. Respective sublines are recorded using a series of pulses that form a set of binary-weighted exposure strobe durations. Exposure durations for recording successive strobed sublines with a particular LED (20, 120) are ordered so that larger duration strobe pulses are followed by shorter duration strobe pulses. A plurality of strobe enable lines are provided to which respective recording elements are connected. A pulse from this set is generated during a subline exposure period on each enable line with each enable line having a pulse generated thereon that is of a different duration than that generated on the other enabling lines during the subline recording period and wherein during a subline exposure period the respective pulses on the enabling lines are substantially nonconcurrent. In one embodiment a series of data bits are formatted for presentation to the printhead (125) by a retransmit line buffer (206, 208) which transmits n times the data of one line of grey level pixels represented by n bits each to a process correction look-up table (220, 222). Another look-up table (216, 218) provides a signal to the process look-up table as to the intensity characteristics of the particular LED which is to print the pixel. The corrected grey level data is then input to a multiplexer (228, 230) which selects one of the n bits for printing in accordance with count signals related to the binary weight of the recording clock pulses.



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⁺ Any designation of "SU" has effect in the Russian Federation. It is not yet known whether any such designation has effect in other States of the former Soviet Union.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 91/03089

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC Int.Cl.5 H 04 N 1/40		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.Cl.5	H 04 N G 06 K	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	US,A,4074319 (GOLDSCHMIDT et al.) 14 February 1978, see abstract; figures 1-3; column 3, line 1 - column 4, line 40; column 5, lines 23-56 ---	1,2,6,7
A	WO,A,8810042 (EASTMAN KODAK COMPANY) 15 December 1988, see abstract; claims 1,2; figure 5 ---	1,6,7, 12,19, 20,25, 26,29
A	US,A,4855760 (KANAYAMA) 8 August 1989, see abstract; figures 1-4,7,8,11,12; column 3, line 57 - column 7, line 17 ---	12-15, 18-24, 29,32
A	US,A,4525729 (AGULNEK et al.) 25 June 1985, see the whole document (cited in the application) ---	12-15, 18-24, 29,32
-/-		
¹⁰ Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
10-02-1992		28 FEB 1992
International Searching Authority		Signature of Authorized Officer
EUROPEAN PATENT OFFICE		 MISS T. TAZELAAR

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

V. ☐ OBSERVATION WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE ¹

This International search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claim numbers _____ because they relate to subject matter not required to be searched by this Authority, namely: _____

2. ☐ Claim numbers _____ because they relate to parts of the International application that do not comply with the prescribed requirements to such an extent that no meaningful International search can be carried out, specifically: _____

3. ☐ Claim numbers _____ because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. ☒ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING ²

This International Searching Authority found multiple inventions in this International application as follows:

Claims 1-11
Claims 12-32

1. ☒ As all required additional search fees were timely paid by the applicant, this International search report covers all searchable claims of the International application
2. ☐ As only some of the required additional search fees were timely paid by the applicant, this International search report covers only those claims of the International application for which fees were paid, specifically claims: _____
3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers: _____
4. ☐ As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

- ☒ The additional search fees were accompanied by applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

III. DOCUMENTS CONSIDERED TO BE RELEVANT

(CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	Journal of Imaging Technology, volume 12, no. 5, October 1986 (Springfield, US) I. Abiko et al.: "High printing quality LED printheads", pages 296-299, see section III; figures 1,3 ---	12-15, 18-24, 29,32
P,A	EP,A,0375431 (XEROX CO.) 27 June 1990, see abstract; claims 1,2,5,9; figures 1-4; column 4, line 56 - column 5, line 36 -----	1,4,6,7 ,12,16, 17,19, 25,26, 29-31

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

US 9103089

SA 47620

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 24/02/92. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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