



Europäisches Patentamt
European Patent Office
Office européen des brevets



Publication number: **0 395 448 A3**

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: **90304653.0**

(51) Int. Cl.⁵: **G03G 15/044, B41J 2/395**

(22) Date of filing: **27.04.90**

(30) Priority: **28.04.89 US 345152**

(43) Date of publication of application:
31.10.90 Bulletin 90/44

(84) Designated Contracting States:
DE FR GB

(88) Date of deferred publication of the search report:
21.08.91 Bulletin 91/34

(71) Applicant: **NIPPON STEEL CORPORATION**
6-3 Otemachi 2-chome Chiyoda-ku
Tokyo 100(JP)

(72) Inventor: **Doggett, David E.**
488 Hill House Road
Boulder Creek, California 95006(US)

(74) Representative: **Jones, Ian et al**
POLLAK MERCER & TENCH High Holborn
House 52-54 High Holborn
London WC1V 6RY(GB)

(54) **Electrostatic print head.**

(57) Each of the plurality of styli contained in an electrostatic print head (101, 102, 103, 104) and used for placing an electrostatic charge on a dielectric coated medium has a rectangular cross section. The thickness of the cross section is selected such that the difference between the lowest voltage on the stylus at which the amount of electrical charge deposited on the dielectric medium for any increase in voltage on the stylus increases substantially in a linear fashion and the lowest voltage on the stylus at which an unwanted background image is formed on

the medium is selected to have a value equal to or less than a selected number. The thickness can be selected to minimize this difference or to ensure that the electrostatic print head (101, 102, 103, 104) performs for some minimum lifetime or to ensure that the distance (d) between adjacent styli in the print head is selected such that current flowing from a stylus having a print voltage applied thereto to a directly adjacent stylus with a lower voltage applied thereto is below a selected number.

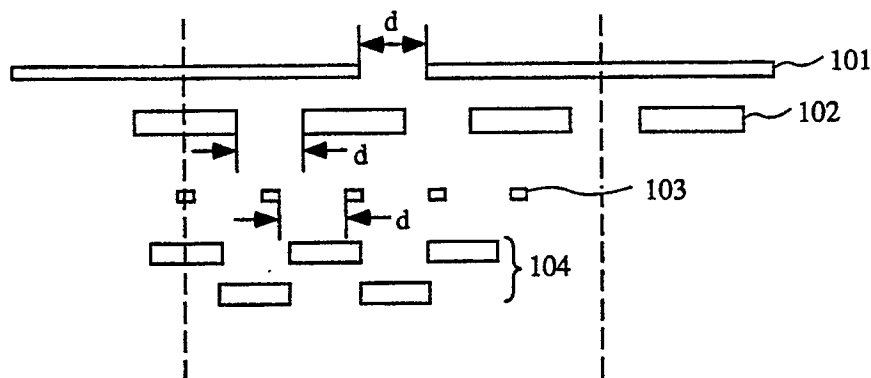


FIGURE 10

EP 0 395 448 A3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 30 4653

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 5)
X	PATENT ABSTRACTS OF JAPAN, vol. 6, no. 171 (P-140)[1049], 4th September 1982; & JP-A-57 89 775 (MITSUBISHI) 04-06-1982 ---	1,2,11, 12	G 03 G 15/044 B 41 J 2/395
X	PATENT ABSTRACTS OF JAPAN, vol. 5, no. 190 (M-100)[862], 4th December 1981; & JP-A-56 111 679 (MITSUBISHI) 03-09-1981 ---	3,5	
Y	IDEM ---	7,8,9, 10	
Y	US-A-4 588 997 (TUAN et al.) * Column 3, lines 26-37 *	1,5,6,9, 10	
A	---	2,12	
Y	US-A-3 958 251 (R.F. BORELLI) * Column 2, lines 2-9 *	1,9,10	
A	---	11,12	
X	US-A-3 946 403 (J. IKEUCHI et al.) * Column 1, lines 66-68; column 2, lines 1-14 *	2,8	TECHNICAL FIELDS SEARCHED (Int. Cl. 5)
Y	---	7	G 03 G
A	---	11,12	B 41 J
Y	US-A-2 919 171 (H. EPSTEIN et al.) * Column 5, lines 7-15,51-65 *	7	
A	---	1,11,12	
Y	US-A-2 918 580 (R.S. HOWELL) * Column 3, lines 15-18 * -/-	5,8	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 17-05-1991	Examiner LEISNER C.O.D.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			



CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid,
namely claims:
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

X LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions,
namely:

1. Claims 1,2,4-12: Printhead with thin styli(4,7-10 so far as depending on 1 or 2).
2. Claim 3,4,7-10: Material for styli of Printhead(4,7-10 so far as depending on 3).

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid,
namely claims:
- ☐ None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims,
namely claims:



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	----	2	
Y	PATENT ABSTRACTS OF JAPAN, vol. 12, no. 27 (M-662)[2874], 27th January 1988; & JP-A-62 181 161 (CANON INC.) 08-08-1987 -----	6	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 17-05-1991	Examiner LEISNER C.O.D.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			