

Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 013 429 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
14.03.2001 Bulletin 2001/11

(51) Int. Cl.⁷: **B41J 2/14**

(43) Date of publication A2:
28.06.2000 Bulletin 2000/26

(21) Application number: **99305770.2**

(22) Date of filing: **21.07.1999**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **25.12.1998 JP 37103398**

(71) Applicant: **FUJITSU LIMITED**
Kawasaki-shi, Kanagawa 211-8588 (JP)

(72) Inventors:
• **Koike, Shuji,**
c/o Fujitsu Limited
Kawasaki-shi, Kanagawa 211-8588 (JP)

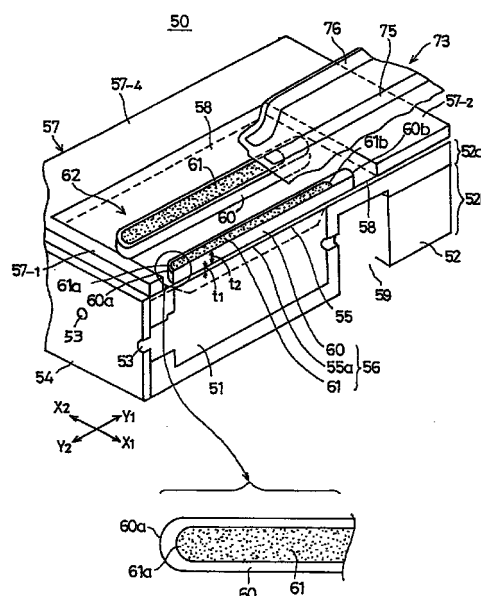
• **Sakamoto, Yoshiaki,**
c/o Fujitsu Limited
Kawasaki-shi, Kanagawa 211-8588 (JP)
• **Shingai, Tomohisa,**
c/o Fujitsu Limited
Kawasaki-shi, Kanagawa 211-8588 (JP)

(74) Representative:
Silverman, Warren et al
Haseltine Lake & Co.
Imperial House,
15-19 Kingsway
London WC2B 6UD (GB)

(54) **Ink jet printer head and printer apparatus**

(57) A piezo-electric reinforcing member surrounding a plurality of pressure generating units is formed in a thin vibrating chromium film membrane. The reinforcing member is not discrete but continuous with respect to a region of the membrane enclosing the pressure generating units. Within the membrane, thermal stress as well as stress caused by differences in the crystal structure of the piezo-electric member and the chromium film arise. The mechanical strength of the reinforcing member itself restrains the shrinkage of the vibrating membrane caused by the internal stress, thereby preventing cracks from occurring in the vibrating membrane. Likewise, the ends of the pressure generating components as well as the individual electrodes are shaped so as to make it difficult for stress to accumulate thereat, thereby also preventing cracks from occurring in the vibrating membrane.

FIG.4



EP 1 013 429 A3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 30 5770

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.7)
X	EP 0 855 273 A (SEIKO EPSON CORP) 29 July 1998 (1998-07-29) * column 3, line 36 - column 25, line 3; figures *	1-13	B41J2/14
Y	---	14,15	
E	EP 0 943 437 A (SEIKO EPSON CORP) 22 September 1999 (1999-09-22) * column 19, line 36 - column 20, line 39; figures 9,10 *	1-7,10, 13	
Y	EP 0 573 055 A (SEIKO EPSON CORP) 8 December 1993 (1993-12-08) * the whole document *	14,15	
A	EP 0 609 080 A (BROTHER IND LTD) 3 August 1994 (1994-08-03) * column 9, line 23 - column 10, line 20; figures *	1-7,10, 13-15	
A	EP 0 835 756 A (NGK INSULATORS LTD ;SEIKO EPSON CORP (JP)) 15 April 1998 (1998-04-15) * the whole document *	1-15	TECHNICAL FIELDS SEARCHED (Int.Cl.7)
P,X	EP 0 893 259 A (SEIKO EPSON CORP) 27 January 1999 (1999-01-27) * column 13, line 57 - column 15, line 37; figure 6 *	1-7,10, 13-15	B41J
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 18 January 2001	Examiner Meulemans, J-P
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	

EPO FORM 1503 03/82 (P04C01)

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

EP 99 30 5770

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

18-01-2001

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0855273 A	29-07-1998	JP 11151812 A	08-06-1999
		US 6113225 A	05-09-2000
		EP 0943437 A	22-09-1999
		WO 9904976 A	04-02-1999
		JP 11151815 A	08-06-1999
EP 0943437 A	22-09-1999	JP 11157069 A	15-06-1999
		JP 11157062 A	15-06-1999
		WO 9904976 A	04-02-1999
		JP 11151815 A	08-06-1999
		EP 0855273 A	29-07-1998
		JP 11151812 A	08-06-1999
		US 6113225 A	05-09-2000
EP 0573055 A	08-12-1993	JP 11268273 A	05-10-1999
		JP 6320725 A	22-11-1994
		DE 69310022 D	28-05-1997
		DE 69310022 T	21-08-1997
		HK 1006559 A	05-03-1999
		US 5424769 A	13-06-1995
		SG 64337 A	27-04-1999
		DE 69311418 D	17-07-1997
		DE 69311418 T	22-01-1998
		EP 0563603 A	06-10-1993
		JP 6143573 A	24-05-1994
		SG 46507 A	20-02-1998
		US 5471232 A	28-11-1995
		US 5539982 A	30-07-1996
		US 5923351 A	13-07-1999
EP 0609080 A	03-08-1994	JP 6218921 A	09-08-1994
		DE 69414731 D	07-01-1999
		DE 69414731 T	27-05-1999
		EP 0861726 A	02-09-1998
		EP 0861727 A	02-09-1998
		EP 0861728 A	02-09-1998
		EP 0860282 A	26-08-1998
		EP 0861729 A	02-09-1998
		US 5508726 A	16-04-1996
EP 0835756 A	15-04-1998	JP 10095112 A	14-04-1998
		US 6070971 A	06-06-2000
EP 0893259 A	27-01-1999	JP 11091104 A	06-04-1999
		US 6109738 A	29-08-2000
		JP 11091103 A	06-04-1999

EPO FORM P448

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82