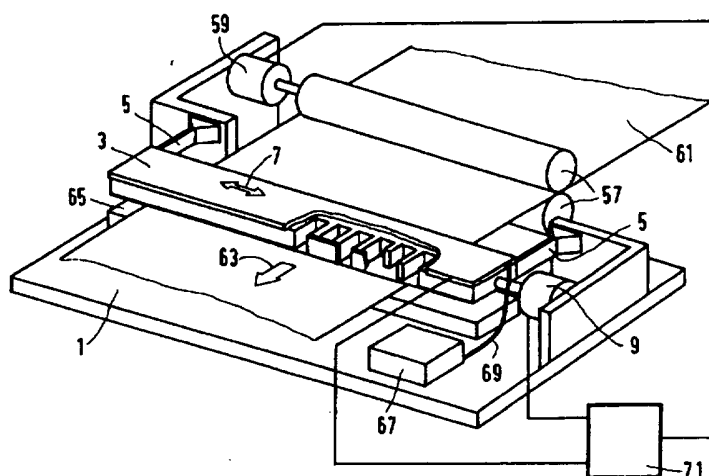




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>(51) International Patent Classification <sup>6</sup>:</b><br><b>B41J 2/145</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>A3</b> | <b>(11) International Publication Number:</b> <b>WO 97/09175</b><br><b>(43) International Publication Date:</b> 13 March 1997 (13.03.97)                                                                                                                                                                                                                                                                                                                   |
| <b>(21) International Application Number:</b> PCT/IB96/00882<br><b>(22) International Filing Date:</b> 2 September 1996 (02.09.96)<br><br><b>(30) Priority Data:</b><br>95202418.0 7 September 1995 (07.09.95) EP<br>(34) Countries for which the regional or international application was filed: NL et al.<br><br><b>(71) Applicant:</b> PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).<br><br><b>(71) Applicant (for SE only):</b> PHILIPS NORDEN AB [SE/SE]; Kottbygatan 7, Kista, S-164 85 Stockholm (SE).<br><br><b>(71) Applicant (for DE only):</b> PHILIPS PATENTVERWALTUNG GMBH [DE/DE]; Röntgenstrasse 24, D-22335 Hamburg (DE).<br><br><b>(72) Inventors:</b> PANKERT, Joseph, Robert, Rene; Lemierser Berg 17, D-52074 Aachen (DE). ROULAUX, Johannes, Richard; Aan de Linde 3, NL-6118 AN Nieuwstadt (NL).<br><br><b>(74) Agent:</b> VEENSTRA, Gustaaf; Internationaal Octrooibureau B.V.; P.O. Box 220, NL-5600 AE Eindhoven (NL). |           | <b>(81) Designated States:</b> CN, JP, KR, SG, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).<br><br><b>Published</b><br><i>With international search report.</i><br><i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i><br><br><b>(88) Date of publication of the international search report:</b><br>10 April 1997 (10.04.97) |

**(54) Title:** INK JET RECORDING DEVICE**(57) Abstract**

The device includes a frame (1) provided with a recording head (3) comprising a plurality of nozzles (33) for the emission of droplets of ink, first driving means (9) for transporting the recording head in a first direction (7) and second driving means (57, 59) for transporting a record carrier (61) in a second direction (63) transverse to the first direction in such a manner that a surface of the record carrier faces the nozzles. The nozzles (33) are arranged in a linear array (55) extending parallel to the first direction (7) with equal spacings between adjacent nozzles. The first driving means (9) is conceived for imparting to the recording head (3) an oscillating motion having an amplitude (A) at least equal to the centre to centre distance (p) of adjacent nozzles (33). The device further comprises a control unit (71) conceived to activate the recording head (3) in such a manner that the emission of droplets of ink from each nozzle (33) is correlated with the momentary position of the recording head relative to the frame (1) during the oscillating motion of the recording head. As a result, a very compact device for depositing ink dots over the entire width of the record carrier (61) is obtained.

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

|    |                          |    |                                          |    |                          |
|----|--------------------------|----|------------------------------------------|----|--------------------------|
| AM | Armenia                  | GB | United Kingdom                           | MW | Malawi                   |
| AT | Austria                  | GE | Georgia                                  | MX | Mexico                   |
| AU | Australia                | GN | Guinea                                   | NE | Niger                    |
| BB | Barbados                 | GR | Greece                                   | NL | Netherlands              |
| BE | Belgium                  | HU | Hungary                                  | NO | Norway                   |
| BF | Burkina Faso             | IE | Ireland                                  | NZ | New Zealand              |
| BG | Bulgaria                 | IT | Italy                                    | PL | Poland                   |
| BJ | Benin                    | JP | Japan                                    | PT | Portugal                 |
| BR | Brazil                   | KE | Kenya                                    | RO | Romania                  |
| BY | Belarus                  | KG | Kyrgyzstan                               | RU | Russian Federation       |
| CA | Canada                   | KP | Democratic People's Republic<br>of Korea | SD | Sudan                    |
| CF | Central African Republic | KR | Republic of Korea                        | SE | Sweden                   |
| CG | Congo                    | KZ | Kazakhstan                               | SG | Singapore                |
| CH | Switzerland              | LI | Liechtenstein                            | SI | Slovenia                 |
| CI | Côte d'Ivoire            | LK | Sri Lanka                                | SK | Slovakia                 |
| CM | Cameroon                 | LR | Liberia                                  | SN | Senegal                  |
| CN | China                    | LT | Lithuania                                | SZ | Swaziland                |
| CS | Czechoslovakia           | LU | Luxembourg                               | TD | Chad                     |
| CZ | Czech Republic           | LV | Latvia                                   | TG | Togo                     |
| DE | Germany                  | MC | Monaco                                   | TJ | Tajikistan               |
| DK | Denmark                  | MD | Republic of Moldova                      | TT | Trinidad and Tobago      |
| EE | Estonia                  | MG | Madagascar                               | UA | Ukraine                  |
| ES | Spain                    | ML | Mali                                     | UG | Uganda                   |
| FI | Finland                  | MN | Mongolia                                 | US | United States of America |
| FR | France                   | MR | Mauritania                               | UZ | Uzbekistan               |
| GA | Gabon                    |    |                                          | VN | Viet Nam                 |

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 96/00882

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B41J 2/145

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B41J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPAT, JAPIO, WPI, NPL

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                  | Relevant to claim No. |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X         | US 4401991 A (VAN C. MARTIN), 30 August 1983<br>(30.08.83), See column 1, line 60 - column 6, line 54                               | 1,4                   |
| A         | --                                                                                                                                  | 2-3,5-8               |
| A         | WO 9002925 A1 (SPECTRA INC.), 22 March 1990<br>(22.03.90), page 4, line 20 - page 6, line 24;<br>page 9, line 16 - page 10, line 11 | 1-8                   |
| E,A       | EP 0748693 A1 (XEROX CORPORATION),<br>18 December 1996 (18.12.96), column 3,<br>line 46 - column 6, line 8                          | 1-8                   |
|           | --                                                                                                                                  |                       |



Further documents are listed in the continuation of Box C.



See patent family annex.

## \* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "B" 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 when the document is taken alone

"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

Date of the actual completion of the international search

6 March 1997

Date of mailing of the international search report

10-03-1997

Name and mailing address of the ISA/  
Swedish Patent Office  
Box 5055, S-102 42 STOCKHOLM  
Facsimile No. +46 8 666 02 86

Authorized officer

Lars Christerson  
Telephone No. +46 8 782 25 00

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 96/00882

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                    | Relevant to claim No. |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A         | Patent Abstracts of Japan, Vol 16, No 335, M-1283,<br>abstract of JP,A,40-99633 (SEIKO EPSON CORP),<br>31 March 1992 (31.03.92)<br><br>--                                                             | 8                     |
| A         | Patent Abstracts of Japan, Vol 9, No 264, M-423,<br>abstract of JP,A,60-109853 (OKI DENKI KOGYO KK),<br>15 June 1985 (15.06.85)<br><br>--                                                             | 8                     |
| A         | Electronics and Communications in Japan, Volume 72,<br>No 7, 1989, N. Morita, "Multinozzle Drop Generator<br>for continuous Ink Jet Printing",<br>page 78 - page 85, See pp. 79-84<br><br>--<br>----- | 1-8                   |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/IB 96/00882

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)                                                                             | Publication<br>date                                                  |
|-------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| US-A- 4401991                             | 30/08/83            | CA-A- 1171453<br>EP-A,B- 0076948<br>JP-C- 1690316<br>JP-B- 3056186<br>JP-A- 58072467                   | 24/07/84<br>20/04/83<br>27/08/92<br>27/08/91<br>30/04/83             |
| WO-A1- 9002925                            | 22/03/90            | AT-T- 115052<br>CA-A- 1323245<br>DE-D,T- 68919839<br>EP-A,B- 0402426<br>JP-T- 2504374<br>US-A- 4864328 | 15/12/94<br>19/10/93<br>13/07/95<br>19/12/90<br>13/12/90<br>05/09/89 |
| EP-A1- 0748693                            | 18/12/96            | CA-A- 2172302                                                                                          | 09/12/96                                                             |