



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**21.11.2007 Bulletin 2007/47**

(51) Int Cl.:  
**B41J 2/355<sup>(2006.01)</sup>**

(21) Application number: **06290839.7**

(22) Date of filing: **18.05.2006**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR**  
Designated Extension States:  
**AL BA HR MK YU**

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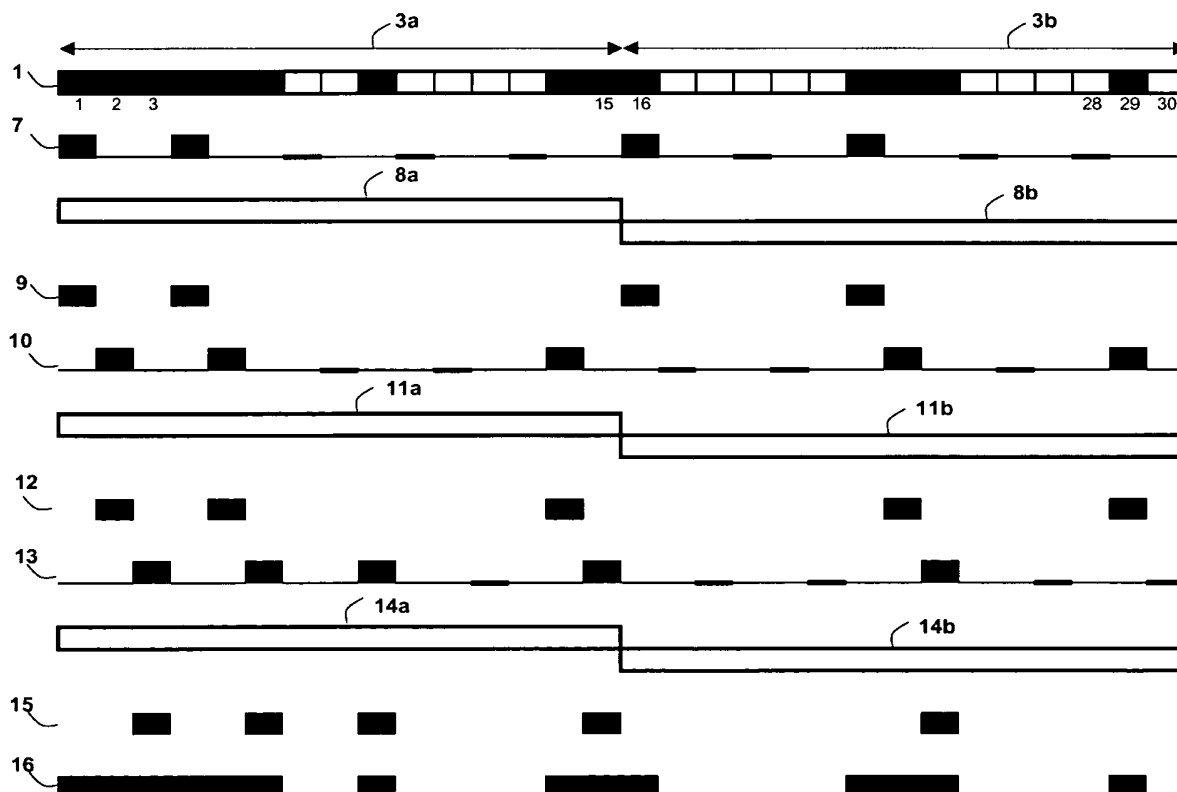
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(54) **Printing method**

(57) It is proposed for achieving a high efficiency in a printing method, especially a thermal sensitive printing method, in which individual areas, especially dots, are printed line by line that the number of individual areas to

be printed is determined in a predeterminable section, the entire section is printed in one printing step, and, if the number is higher than the limit, the section is divided into partial areas and the partial areas are printed in time-staggered printing steps.



**FIG. 2**

## Description

**[0001]** The invention relates to a printing method, especially a thermal sensitive printing method, in which individual areas, especially dots, are printed line by line.

**[0002]** A predetermined power is required for printing in known such printers for the individual areas, with the power for one line resulting from the sum total of the powers for the individual areas to be printed. When all individual areas of a line are printed, a relatively high amount of power is required. In order to lower the required power, print heads are known in which a line is divided into areas known as strobos, with the strobos being printed successively. When a line is divided into four strobos, the required power can be reduced to one-quarter of the total power for a line. In addition to the required power, the required time for the printing of a page is relevant. Although an increase in the number of strobos leads to a reduction in the required power, it also leads to an increase in the required time for the printing of a page. The ratio of required time for printing to required power represents the efficiency of the printer.

**[0003]** It is the object of the present invention to provide a printing method of the kind mentioned above in which the known disadvantages are avoided, which has a high efficiency, can be used in conventional print heads and with which a short time can be achieved for the printing of a page at low power.

**[0004]** This is achieved in accordance with the invention in such a way that the number of the individual areas to be printed is determined in a predeterminable section insofar as the number is smaller than a predeterminable limit, the entire section is printed in one printing step, and insofar as the number is larger than the limit, the section is divided into partial areas and the partial areas are printed in temporally staggered printing steps.

**[0005]** This leads to the advantage that the maximum required power which corresponds to the provisioning power is predetermined by the power for an individual area multiplied with the limit. Insofar as the required power lies beneath the provisioning power for a section, the section is printed in one printing step and thus in a short time. Insofar as the provisioning power is exceeded, the section cannot be printed in a single printing step and the section is divided into partial areas and the partial areas are each printed in a single printing step. The number of required printing steps can thus be kept at a low level, with a low required time being ensured for the printing of a page. It is further advantageous that there is merely a rapidly performed counting of the individual areas to be printed, as a result of which the required processing power is kept at a low level and the printing method can be performed easily and quickly.

**[0006]** It can be provided in accordance with a further development of the invention that the entire section is printed in one printing step insofar as the number is equal to the limit, as a result of which equality of the number with the limit ensures a low number of printing steps.

**[0007]** According to a further embodiment of the invention it can be provided that a print head is used in which the lines are grouped in strobos and that the sections are chosen according to the strobos. The printing method can thus be applied in a simple way to such print heads, with a simple response of the print head being enabled. A response of several strobos during a printing step which is not provided for in many such print heads is not necessary in this respect.

**[0008]** In a further development of the invention it can be provided that the partial areas are chosen with equal size, as a result of which the printing method can be kept especially simple and the required processing power can be kept low. It can further be ensured that each percentage rate of individual areas to be printed can be printed in the partial areas with the provisioning power. The number of individual areas to be printed in the partial areas need not be defined.

**[0009]** According to a further embodiment of the invention it can be provided that the limit is chosen according to half the number of the individual areas of a section and the partial areas correspond to half the section. This represents an especially simple choice, which can thus ensure efficient printing.

**[0010]** In a further embodiment of the invention it can be provided that there is a line feed during at least one of the printing steps, preferably during all of the printing steps. The required time for the printing of a page can be kept especially short by the line feed during the printing steps because the required time for the line feed need not be provided in addition to the printing steps. A line feed can be provided during each printing step or only during certain predeterminable printing steps.

**[0011]** In a further development of the invention it can be provided that a line feed occurs after at least one of the printing steps, with the number being determined in particular during the line feed. A line feed can be provided after each printing step.

**[0012]** According to a further embodiment of the invention it can be provided that the speed of the line feed during the printing step of a partial area is chosen smaller than during the printing step of the entire section, as a result of which the line feed can easily be adjusted to the required number of printing steps.

**[0013]** In a further development of the invention it can be provided that the speed of the line feed during the printing step of an entire section in which the number is zero is chosen higher than during the printing step of an entire section in which the number is higher than zero. The required time for the printing of a page can be kept especially low.

**[0014]** The invention further relates to a computer program product which can be loaded directly into the internal memory of a computer and comprises software code sections with which the steps of the above printing method can be performed when the computer program product is running on a computer. The printing method in accordance with the invention can thus flexibly be integrat-

ed in an application.

**[0015]** The invention further relates to a data medium with a computer program product as described above. Such a computer program product is thus easily transportable and storable.

**[0016]** The invention is now explained in closer detail by reference to the enclosed drawings illustrating embodiments in an exemplary manner, wherein:

Fig. 1 shows the method for printing a line, as is used in conventional printers, and

Fig. 2 shows the method in accordance with the invention for printing a line.

**[0017]** In the printing method in accordance with the invention, individual areas are printed in lines, with the individual areas especially being dots. In other embodiments the individual areas can also be formed by a predeterminable number and arrangement of dots, or of different structures such as triangles, rectangles or other polygons. The printing method has proven to be especially suitable in thermal sensitive printing methods.

**[0018]** The number of the individual areas to be printed is determined in a predeterminable section. Insofar as the number is smaller than a predeterminable limit, the entire section is then printed in one printing step. If the number is higher than the limit, the section is divided into partial areas and the partial areas are printed in time-staggered printing steps.

**[0019]** The printing method is especially suitable for foil printers, in which a thin wax layer is applied to one side of a foil. The wax layer is in contact with the paper which will be printed. The print head 1 is arranged on the side of the foil averted from the paper. It comprises heating elements 2 which are each associated with an individual area and are usually of a square configuration and arranged as dots. The foil and the wax layer are heated by the heating element 2 which can be arranged as a resistor, with molten wax being absorbed by the paper and producing a permanent printed dot. The print head 1 can be arranged as a line print head, with which a line can be printed. The number of individual areas is proportional to the achievable resolution of the printer. Such printers are especially used in fax machines.

**[0020]** A predetermined power is required for printing an individual area, which power is the required power for heating in a thermal sensitive printing method. When several individual areas are printed, the required power corresponds to the sum total of the individual powers of the individual areas. The production costs of a printing apparatus can be kept low when the maximum required power can be kept low. In conventional printing methods however, low power usually requires long periods for the printing of a page.

**[0021]** As a result of the required power for an individual area and the limit, the maximum required power for simultaneous printing of individual areas corresponding to the limit is predetermined, which corresponds to the

provisioning power. The number of individual areas corresponding to the limit can be printed with the provisioning power. Insofar as the number of individual areas to be printed in the section is lower than the limit, the entire section can be printed at once with a power beneath the provisioning power, which is why the section is then printed in one printing step.

**[0022]** If the number is larger in a section than the limit, the provisioning power is not sufficient in order to print the entire section in one printing step. In this case, the section is divided into partial areas and the partial areas are printed in time-staggered printing steps. It is necessary to ensure that each of the partial areas can be printed in one printing step with a power not exceeding the provisioning power.

**[0023]** If the number is equal to the limit, it can be provided that the entire section is printed in one printing step. The limit is chosen in such a way that the product of the limit with the required individual power for one of the individual areas lies beneath the provisioning power or is at most equal to the same.

**[0024]** The printing method can be carried out in a simple and quick way. Especially the steps for determining whether one of the sections needs to be divided into partial areas can be performed for each section without any major numerical effort. This ensures that the number for each section can be determined directly prior to the printing for this section and the time required for this purpose can be kept especially short. It can be provided in particular that the determination of the number is interrupted once the limit has been exceeded and the section is divided into partial areas. If there is an interruption upon reaching the limit, the partial area can be chosen in a simple manner in such a way that the number of the individual areas of the partial area corresponds to the limit. The determination of the number can then optionally be started for the remainder of the section.

**[0025]** It can also be provided that the partial areas are chosen with the same size. It can be provided that the section is divided into a predeterminable quantity of partial areas once the number is larger than the limit. The quantity of partial areas is chosen in such a way that each partial area can be printed with the provisioning power in one printing step.

**[0026]** It can be provided for especially that the limit corresponds to half the number of the individual areas of a section and the partial areas correspond to half the section. Insofar as the number of the individual areas to be printed is higher in a section than the limit, it is necessary to divide the section into two partial areas. These partial areas can be chosen with the same size.

**[0027]** A line feed can occur during the printing steps. The line feed can occur during some of the printing steps or during several of the printing steps. The line feed preferably occurs during all or at least during approximately all printing steps.

**[0028]** The speed of the line feed can be chosen to be smaller during the printing step of a partial area than dur-

ing the printing step of an entire section. It can be ensured that the line section is of equal size for a section, irrespective of whether it is printed in one or in several printing steps. If the section is optionally divided into two partial areas, the speed of the line feed of the partial areas can be chosen half as large as the speed of the line feed of the section.

**[0029]** When a section is printed in which the number of the individual areas to be printed is equal zero, the speed of the line feed during the printing step of this section can be chosen higher than during the printing step of an entire section in which the number is higher than zero. The required time for printing a page can be kept especially low.

**[0030]** It can also be provided that a line feed occurs after at least one of the printing steps. If the line feed is not sufficient during the printing steps in order to reach the line feed of a complete line during a line, the missing line feed can thus be compensated. This compensation can be divided among several printing steps and occur especially during the determination of the number of the individual areas to be printed.

**[0031]** The printing method can simply be implemented in a conventional print head 1, in which a line is divided into areas which are called strobos 3a, 3b, with strobos 3a, 3b being printed successively. It is common practice to access and print merely one of the strobos 3a, 3b. In these print heads, the sections are preferably chosen according to the strobos 3a, 3b, so that one section corresponds to a strobe 3a, 3b. Existing printers can also especially be retrofitted in a simple way. If several strobos 3a, 3b can be accessed simultaneously, then it is also possible to combine several strobos 3a, 3b into a section. The section can further be chosen independent of the size of strobos 3a, 3b. The limits of strobos 3a, 3b and the sections need not coincide.

**[0032]** The printing method can be implemented as a computer program product which can be loaded directly into the internal memory of a computer and comprises software code sections with which the steps of the printing method in accordance with the invention are carried out when the computer program product runs on a computer. The computer is preferably a processor of a printer or the like. The computer program product can be stored especially on a data medium.

**[0033]** For clarification, the figures show a conventional printing method and one in accordance with the invention in schematic view by way of example.

**[0034]** Figure 1 represents the normal procedure, as it is usually used to print one line using a thermal sensitive print head 1 composed of heat elements 2 arranged in a line.

**[0035]** For reasons of simplification we have assumed in figure 1 that the print head 1 is composed of 30 heat elements 2, grouped in two strobos 3a, 3b, usually called strobos 3a, 3b, each of them 15 heat elements 2 long. In order to print one dot, the corresponding heat element 2 has to be activated. The heat elements 2 which have

to be activated for the line just represented, are marked as black in figure 1. The signal 4 sent to the print head 1 contains the information which heat elements 2 are active for this line. After this information has been sent, the two strobos 3a, 3b of the print head 1 are activated one after the other 5a, 5b. As a result, the pattern 6 will be printed.

**[0036]** Either during this whole procedure, or after the procedure is finished, a line feed has to be done. Usually the line feed is done during the activation 5a, 5b of the strobos 3a, 3b.

**[0037]** Assuming an available power of only one third of the power requested by the usual printing method as described in Fig 1, the threshold of the highest number of heat elements 2 which are allowed to be activated simultaneously will be the total number of heat elements 2 in one strobe 3a, 3b divided by three. For the case represented in Figure 1 the threshold will be 5, since each strobe 3a, 3b has 15 heat elements 2.

**[0038]** Figure 2 represents the same situation as in Fig. 1 but now applying the method of this invention.

**[0039]** The printing of a line will be done in a number of N steps where N equal the number of heat elements 2 in one strobe 3a, 3b divided by the threshold value. In each step it will be activated only, at highest, the threshold number of dots. For the case represented in Fig. 2, the number N of steps will be three and the threshold value is five.

**[0040]** There are different methods to choose the dots in each step. Fig. 2 represents the method of choosing every N<sup>th</sup> dot, in this particular example, every third dot.

**[0041]** In the first step, the signal 7 sent to the print head 1 will, first of all, set to inactive all dots, except every third beginning with the first one. Among the remaining dots, only those which have to be printed will be activated. After this information has been sent, the two strobos 3a, 3b of the print head 1 are activated one after the other 8a, 8b. As a result, the pattern 9 will be printed.

**[0042]** In the second step, the signal 10 sent to the print head 1 will, first of all, set to inactive all dots, except every third beginning with the second one. Among the remaining dots, only those which have to be printed will be activated. After this information has been sent, the two strobos 3a, 3b of the print head 1 are activated one after the other 11a, 11b. As a result, the pattern 12 will be printed.

**[0043]** In the third and last step, the signal 13 sent to the print head 1 will, first of all, set to inactive all dots, except every third beginning with the third one. Among the remaining dots, only those which have to be printed will be activated. After this information has been sent, the two strobos 3a, 3b of the print head 1 are activated one after the other 14a, 14b. As a result, the pattern 15 will be printed.

**[0044]** After the whole procedure has been completed, the complete information 16 has been printed. Either during printing, or after the printing is finished, a line feed has to be done. If the line feed is done during printing, then it may be done either during the activation of the

strokes 3a, 3b in one step, moving the medium to be printed with the speed S equal to a line feed / stroke activation duration, or it may be done during the complete printing procedure moving the medium to be printed with speed S3 equal a line feed / three times the stroke activation duration.

[0045] Further embodiments in accordance with the invention merely comprise a part of the described features. Any combination of features can be provided, especially also of different described embodiments.

## Claims

1. A printing method, especially a thermal sensitive printing method, in which individual areas, especially dots, are printed line by line, **characterized in that** the number of the individual areas to be printed is determined in a predeterminable section insofar as the number is smaller than a predeterminable limit, the entire section is printed in one printing step, and, insofar as the number is larger than the limit, the section is divided into partial areas and the partial areas are printed in temporally staggered printing steps.
2. A printing method according to claim 1, **characterized in that** the entire section is printed in one printing step insofar as the number is equal to the limit.
3. A printing method according to claim 1 or 2, **characterized in that** a printing head (1) is used in which the lines are grouped in strokes (3a, 3b) and that the sections are chosen according to the strokes (3a, 3b).
4. A printing method according to claim 1, 2 or 3, **characterized in that** the partial areas are chosen with the same size.
5. A printing method according to one of the claims 1 to 4, **characterized in that** the limit is chosen according to half the number of individual areas of a section and the partial areas correspond to half the section.
6. A printing method according to one of the claims 1 to 5, **characterized in that** a line feed occurs during at least one of the printing steps, preferably during approximately all of the printing steps.
7. A printing method according to one of the claims 1 to 6, **characterized in that** a line feed occurs after at least one of the printing steps.
8. A printing method according to claim 6 or 7, **characterized in that** the speed of the line feed during the printing step of a partial area is chosen lower

than during the printing step of an entire section.

9. A printing method according to claim 6, 7 or 8, **characterized in that** the speed of the line feed is larger during the printing step of an entire section in which the speed is zero than during the printing step of an entire section in which the number is higher than zero.
10. A computer program product which can be loaded directly into the internal memory of a computer and comprises software code sections with which the steps of the printing process according to one of the claims 1 to 9 are carried out when the computer program product runs on a computer.
11. A data medium with a computer program product according to claim 10.

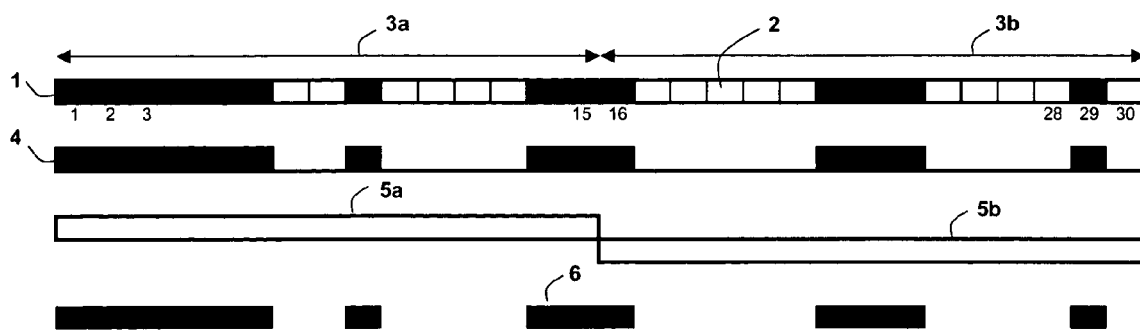


FIG. 1

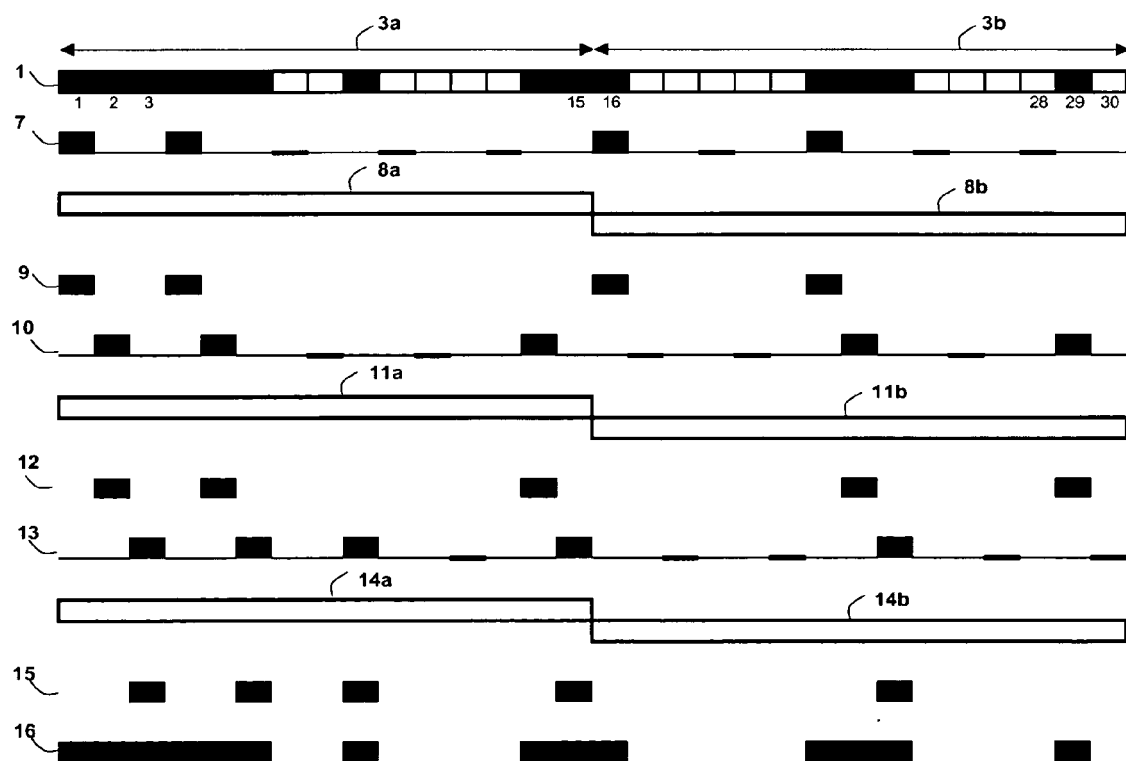


FIG. 2



European Patent  
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# EUROPEAN SEARCH REPORT

Application Number  
EP 06 29 0839

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                    |                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                       |                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Category                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                                                                                                                             | Relevant to claim                                                                                                                                                                                                                                                                     | CLASSIFICATION OF THE APPLICATION (IPC)    |
| X                                                                                                                                                                                                                                                      | US 5 412 406 A (FUJIMOTO ET AL)<br>2 May 1995 (1995-05-02)<br>* abstract *<br>* column 3, line 8 - column 4, line 52 *<br>* figures *                                                                     | 1-11                                                                                                                                                                                                                                                                                  | INV.<br>B41J2/355                          |
| X                                                                                                                                                                                                                                                      | -----<br>PATENT ABSTRACTS OF JAPAN<br>vol. 013, no. 060 (M-796),<br>10 February 1989 (1989-02-10)<br>& JP 63 264372 A (SEIKO INSTR &<br>ELECTRONICS LTD),<br>1 November 1988 (1988-11-01)<br>* abstract * | 1-11                                                                                                                                                                                                                                                                                  |                                            |
| X                                                                                                                                                                                                                                                      | -----<br>PATENT ABSTRACTS OF JAPAN<br>vol. 014, no. 193 (M-0963),<br>19 April 1990 (1990-04-19)<br>& JP 02 036956 A (MITSUBISHI ELECTRIC<br>CORP), 6 February 1990 (1990-02-06)<br>* abstract *           | 1-11                                                                                                                                                                                                                                                                                  |                                            |
| X                                                                                                                                                                                                                                                      | -----<br>US 6 234 695 B1 (FREEDMAN SHARON CORINNE<br>ET AL) 22 May 2001 (2001-05-22)<br>* abstract *<br>* column 4, line 33 - column 5, line 30 *<br>* figures *                                          | 1-11                                                                                                                                                                                                                                                                                  | TECHNICAL FIELDS<br>SEARCHED (IPC)<br>B41J |
| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                       |                                            |
| Place of search<br>The Hague                                                                                                                                                                                                                           |                                                                                                                                                                                                           | Date of completion of the search<br>6 October 2006                                                                                                                                                                                                                                    | Examiner<br>Didenot, Benjamin              |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                                                                                                                           | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>-----<br>& : member of the same patent family, corresponding document |                                            |

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EPO FORM 1503 03.02 (P04C01)

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

EP 06 29 0839

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  
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06-10-2006

| Patent document<br>cited in search report |    | Publication<br>date | Patent family<br>member(s) |            | Publication<br>date |
|-------------------------------------------|----|---------------------|----------------------------|------------|---------------------|
| US 5412406                                | A  | 02-05-1995          | CN                         | 1077293 A  | 13-10-1993          |
|                                           |    |                     | JP                         | 5229162 A  | 07-09-1993          |
| -----                                     |    |                     |                            |            |                     |
| JP 63264372                               | A  | 01-11-1988          | NONE                       |            |                     |
| -----                                     |    |                     |                            |            |                     |
| JP 02036956                               | A  | 06-02-1990          | NONE                       |            |                     |
| -----                                     |    |                     |                            |            |                     |
| US 6234695                                | B1 | 22-05-2001          | US                         | 6503006 B1 | 07-01-2003          |
| -----                                     |    |                     |                            |            |                     |