



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
26.05.2010 Bulletin 2010/21

(51) Int Cl.:
B41J 2/21 (2006.01) B41J 11/42 (2006.01)

(21) Application number: **08169535.5**

(22) Date of filing: **20.11.2008**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA MK RS

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(54) **Dot matrix print method and apparatus with feed alternating**

(57) A method of dot matrix printing, in particular ink jet printing comprises the following steps. Firstly, recording a first swath (11) of corresponding print data. Secondly, feeding a medium relative to a print head in a first direction (D1) transverse to a fast scan direction (F) and over a first distance. Thirdly, recording a second swath (12) of corresponding print data at the first distance from the first swath, wherein the first distance is such that the second swath does not touch or overlap the first swath.

Fourthly, feeding the medium relative to the print head in a second direction (D2) and over a second distance, the second direction being the reverse of the first direction and fifthly, recording a third swath (13) of corresponding print data at the second distance from the second swath, wherein the second distance is such that the third swath does not touch or overlap the second swath. Apparatuses for carrying out methods of the invention are also disclosed.

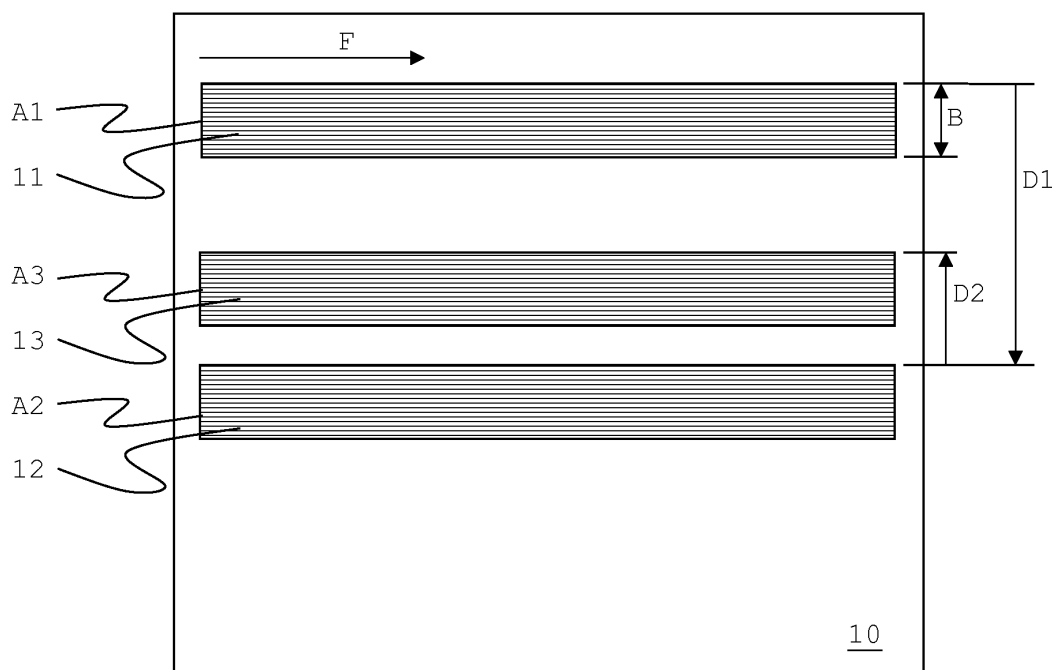


FIG 1

Description**Field of the invention**

5 **[0001]** The present invention is related to methods and apparatuses for dot matrix printing, such as ink jet printing. Methods provide for printing an image in swaths. The drying time of each swath before recording a neighbouring swath is optimized, while the printing speed is kept high. Methods and apparatuses of the invention reduce banding phenomena that are caused by wet swaths that overlap or touch.

State of the art

10 **[0002]** On a traditional dot matrix printer, a family of printers to which an ink jet printer belongs, an image is recorded (formed) on a printable medium by printing a series of complementary rectangularly shaped stripes (also called bands or swaths). The dot matrix printer therefore comprises a print head for recording ink dots on the medium. The print head is also referred to as a scanning carriage. Ink dots are typically recorded by firing ink droplets from nozzles provided on
15 the print head. The nozzles are arranged in one or more arrays. The arrays have a length which is typically much smaller than the dimension of the print medium.

20 **[0003]** A swath is therefore recorded by a single translation of the print head relative to the medium in a predetermined direction, typically transverse to the arrayed disposition of the nozzles. The recording of a swath is referred to as a fast scan or a pass. The direction of the fast scan is referred to as the fast scan direction or the direction of a pass of the print head. Ink fired repetitively from one nozzle during a pass, appears on the printable medium along a line. This line is called a raster or pixel line, which also refers to a row of the dot matrix.

25 **[0004]** The swaths are either printed adjacent to each other, or overlap to a certain degree. The latter case is often referred to as multi-pass printing. In the overlap portion of a swath, raster lines in between existing raster lines can be printed so as to increase the resolution of the printed image. This is referred to as interlace printing.

30 **[0005]** It is known that both single pass and multi pass ink jet print outs suffer from a number of artefacts, such as banding, step mismatches, ink bleeding, etc. The present invention primarily tackles the problem of ink bleeding, which is a phenomenon in which ink, recorded at a given location does not stay in place, but migrates. The effect is particularly visible along borders of a swath or where sharp colour transitions occur.

35 **[0006]** Generally speaking, ink bleeding may be present throughout the printed area. However, the occurrence of other artefacts, such as step mismatches, banding, etc. enhance the visibility of ink bleeding along the borders of print swaths. Ink bleeding or ink migration across the borders of swaths is referred to in the art as "banding" phenomena.

40 **[0007]** An important cause for ink bleeding is a swath whose ink is still (partially) wet. This wet ink attracts the ink recorded along the border of the swath resulting in an ink flow from the newly recorded swath towards the previously recorded swath. This problem occurs particularly when high printing speeds are used and the ink is not allowed to dry sufficiently before recording a new swath.

45 **[0008]** It is known in the art to reduce the occurrence of banding phenomena by reducing the amount of ink that is recorded in a single swath and spreading the total amount of ink over multiple, overlapping swaths (multi-pass printing). Patent application WO 2008/040712 discloses shingle masks that can be used for that purpose.

50 **[0009]** In order to increase printing speeds, most dot matrix (ink jet) printing apparatuses can print bidirectionally. The print head records swaths in passes that have alternately opposite directions. The order of superposition of ink colourants can possibly not be the same for bidirectional passes. This can lead to differences in hue across consecutive swaths that are recorded bidirectionally.

55 **[0010]** Another artefact can occur when printing bidirectionally overlapping swaths. In case e.g. a first swath is recorded from left to right, the consecutively recorded swath will be recorded from right to left. Hence, the arrival position for the print head in the first swath is also the print head's starting position in the second swath. Consequently, the ink dry time for the first swath is less at the arrival position compared to the starting position (of the print head in the first swath). Hence, at the arrival position of the first swath, the ink recorded in the first swath has less time to dry before the second swath is recorded than at the other end. This can give rise to bidirectional banding artefacts.

Summary of the invention

60 **[0011]** The present invention aims to provide a method of dot matrix printing which at least partially overcomes the drawbacks of prior art methods. It is an aim of the invention to provide at least an alternative method of dot matrix printing.

65 **[0012]** In particular, methods of dot matrix printing of the invention aim to reduce banding artefacts caused by wet ink bleeding compared to methods of the prior art, in particular at swath borders and/or at overlapping portions of swaths.

70 **[0013]** Methods of dot matrix printing of the invention aim to reduce bidirectional banding artefacts compared to methods of the prior art.

[0014] The present invention also aims to provide apparatuses for dot matrix printing which do not suffer from drawbacks of prior art apparatuses, particularly drawbacks of banding artefacts caused by wet ink bleeding and/or bidirectional banding artefacts. It is an aim of the invention to provide at least an alternative apparatus for dot matrix printing.

[0015] The present invention also aims to overcome at least partially the banding phenomena as identified above without (substantial) loss of printing speed.

[0016] Aspects of the present invention relate to methods of and apparatuses for dot matrix printing as set out in the appended claims. Methods and apparatuses according to the present invention meet aims of the invention and in particular overcome drawbacks of the prior art.

[0017] According to a first aspect of the invention, there is provided a method of dot matrix printing, in particular ink jet printing. Printing is performed by a print head recording print data on a medium in swaths by scanning the print head relative over the medium along a fast scan direction. Methods according to the invention comprise the following steps. Firstly, recording a first swath of corresponding print data. Secondly, feeding the medium relative to the print head in a first direction transverse to the fast scan direction and over a first distance. Thirdly, recording a second swath of corresponding print data at the first distance from the first swath, wherein the first distance is such that the second swath does neither touch nor overlap the first swath. Fourthly, feeding the medium relative to the print head in a second direction and over a second distance, the second direction being the reverse of the first direction and fifthly, recording a third swath of corresponding print data at the second distance from the second swath. The second distance is such that the third swath does neither touch nor overlap the second swath.

[0018] The five steps as indicated above are preferably performed consecutively in the order as indicated.

[0019] Preferably, the third swath is recorded at a location on the medium interposed between the first and the second swath.

[0020] Preferably, the first direction corresponds to a direction wherein the medium is advanced relative to the print head (i.e. a forward feed).

[0021] Preferably, methods according to the present invention comprise iterating the second to the fifth steps.

[0022] Preferably, methods according to the present invention further comprise at least one sequence of a further feeding step followed by a further recording step. The direction of feeding the medium of the further feeding step is the reverse of the direction in the last feeding step preceding said further feeding step. The distance over which feeding the medium of the further feeding step is such that the swath recorded in the further recording step does neither touch, nor overlap the swath recorded in the last recording step preceding said further recording step.

[0023] Preferably, methods according to the invention comprise iterating a sequence consisting of the second to the fifth steps and said at least one sequence.

[0024] Preferably, the medium feeding distance is about equal for all feeding steps in the first and/or the second direction. More preferably, the medium feeding distance is about equal for all feeding steps in the backward feeding direction relative to the print head. The term "about equal" refers to values falling within a range between 0.9 and 1.1 times the average relevant feeding distance, more preferably between 0.95 and 1.05 times said average.

[0025] Preferably, the medium feeding distance is different for at least two feeding steps in the first or the second direction. More preferably, the medium feeding distance is different for at least two feeding steps in the advance feeding direction relative to the print head.

[0026] The advance feeding direction refers to the direction of feeding the medium in which the medium is increasingly fed relative to the print head, in other words it is the direction in which the medium is applied to the print head (the printing apparatus). The backward feeding direction refers to the reverse of the advance feeding direction.

[0027] Preferably, in methods according to the present invention p swaths are superposed, $p \geq 1$ (hence, can be a single or a multi-pass print method). The case $p = 1$, refers to single pass printing, wherein no swaths are superposed (only one swath is recorded at each printing location). Let swaths positioned (or located) consecutively on the medium be numbered with consecutive natural numbers, then, preferably, the chronological order of recording swaths on the medium follows at least in part the sequence:

$$\begin{aligned} b_{2i} &= b_{2i-1} - (s + 1), \\ b_{2i+1} &= b_{2i} + (s + 3), \end{aligned}$$

wherein s is an even natural number equal to or larger than p and b_i is a natural number which represents the swath recorded at position i in the chronological sequence. More preferably, p is even. Preferably, $p > 1$.

[0028] Preferably, in methods according to the present invention p swaths are superposed, $p \geq 1$ (hence, can be a single or a multi-pass print method). The case $p = 1$, refers to single pass printing, wherein no swaths are superposed (only one swath is recorded at each printing location). Let swaths positioned (or located) consecutively on the medium be numbered with consecutive natural numbers, then, preferably, the chronological order of recording swaths on the medium follows at least in part the sequence:

$$b_1 = 1,$$

$$b_{m(2p+3)+2} = b_{m(2p+3)+1} + p + 2$$

and $b_i = b_{i-2} + 1$ for the other members of the sequence, wherein b_i represents the swath recorded at position i in the sequence and m is a natural number ($= 0, 1, 2, 3, \dots$). More preferably, p is odd.

[0029] Preferably, the step of feeding in the first direction and/or the step of feeding in the second direction comprises the steps of feeding over a larger distance than respectively the first or second distance followed by feeding in the reverse direction to the position corresponding with respectively the first or second distance.

[0030] Preferably, the step of recording a swath comprises curing the ink of said swath by UV radiation.

[0031] According to a second aspect of the invention, there is provided an apparatus for dot matrix printing, particularly for ink jet printing. Apparatuses according to the invention comprise means for carrying out methods of the present invention.

[0032] Apparatuses according to the invention preferably comprise a print head for recording swaths of ink on a medium by scanning the print head relative over the medium along a fast scan direction. Apparatuses according to the invention preferably comprise means for feeding the medium relative to the print head in a first direction transverse to the fast scan direction and in a second direction reverse of the first direction.

[0033] Preferably, apparatuses of the invention comprise means for UV curing recorded ink.

Brief description of the drawings

[0034] Figure 1 represents a plan view of a print medium (sheet) onto which three swaths are recorded according to methods of the invention.

[0035] Figure 2 represents the order of recording swaths according to a first preferred embodiment of the invention, applied to a two-pass print method. Figure 2 shows a plan view of a print medium and different positions of a print head 20 on the medium. The print head is arranged to perform (bidirectional) fast scans along a direction F. Each represented position of the print head (nozzle array) represents a swath 21, wherein swaths located successively on the medium are numbered with successive natural numbers $n, n+1, n+2, \dots$. Reference symbols b_i and the curved arrows represent the chronological order of recording the swaths and hence represent chronologically successive positions of the print head relative to the medium.

[0036] Figure 3 represents the order of recording swaths according to a second preferred embodiment of the invention, applied to a one-pass print method. Swaths are represented by the corresponding position of the print head (nozzle array) as explained for figure 2.

[0037] Figure 4 represents the order of recording swaths according to a third preferred embodiment of the invention, applied to a one-pass print method. Swaths are represented by the corresponding position of the print head (nozzle array) as explained for figure 2.

[0038] Figure 5 represents an improved method of feeding in order to reduce positioning inaccuracies due to play and/or backlash. A printing apparatus is represented by a print head 51 and feed rolls 52. The print head records a swath 53 on a print medium 50.

Detailed description of the invention

[0039] Embodiments of the present invention will be described wherein a print head carries out fast scans over a print medium and the medium is repeatedly fed to the printing apparatus (i.e. scanning carriage print heads). However, the invention is not limited to such printing apparatuses, but can be applied as well to those types of apparatuses, wherein the print head carries out both fast scans and feed movements. However, the former types of apparatuses are preferred for carrying out aspects of the invention.

[0040] In methods of dot matrix printing of the invention, print data is recorded on a medium in swaths of which the longitudinal orientation is arranged along (or parallel with) the direction of the fast scan.

[0041] The term scanning a pixel location refers to the fact that during the scanning said pixel location is configured to be addressed by the print head. Hence, each time a pixel location is scanned by the print head, that pixel location is configured to receive ink. Whether the pixel location actually receives ink during said scan depends on the print data.

[0042] In describing the present invention, the expression scanning a same pixel location in different passes refers to that print data relating to a same pixel is configured to be recorded in different passes.

[0043] The term "swaths are superposed" refers to swaths that at least partially are made to overlap. The term overlapping is to be interpreted on a macroscopic level, i.e. it refers to overlapping of areas which are larger than one pixel, preferably larger than two pixels, more preferably larger than four pixels and most preferably larger than 10 pixels (smallest size).

[0044] Referring to figure 1 for illustrative purposes only, according to methods of the invention, a first swath 11 of

corresponding print data is recorded (by a print head) on a first area A1 of a print medium 10. Thereafter, the medium is fed relatively to the print head (print apparatus) in a first (feed) direction D1, which is different from the fast scan direction F (direction of longitudinal orientation of the swaths) and over a first distance to a second area A2 of the print medium 10. Thereafter, a second swath 12 of print data is recorded on the second area A2. The print data recorded in the second swath is print data corresponding to the second area.

[0045] The first direction D1 is transverse to the fast scan direction F. The first direction D1 is preferably (substantially) perpendicular to the fast scan direction F. More preferably, the absolute angle between the first direction and the fast scan direction falls in the range between 70° and 110°, most preferably between 80° and 100°. The first direction (feed direction) is preferably parallel to the arrayed disposition of the nozzles in the print head.

[0046] The first distance is such that when the second swath 12 of corresponding print data is recorded, the second swath does neither touch nor overlap the first swath 11. The first distance is hence larger than the breadth B of a swath. The second area A2 hence does neither touch nor overlap the first area A1.

[0047] After recording the second swath 12, the medium 10 is fed in a second (feed) direction D2, which is the reverse direction of the first direction D1 and over a second distance to a third area A3 of the print medium. Thereafter, a third swath 13 of print data is recorded on the third area A3. The print data recorded in the third swath is print data corresponding to the third area.

[0048] The second distance is such that when the third swath 13 of corresponding print data is recorded, the third swath 13 does neither touch nor overlap the second swath 12. Hence, the second distance is selected larger than the breadth B of a swath. Thus, print methods of the invention are so arranged that the second area A2 and the third area A3 on the print medium do neither touch, nor overlap. This aspect of the invention can be beneficial for reducing banding artefacts caused by wet ink bleeding.

[0049] The third swath can touch or overlap the first swath. Preferably, swaths that are recorded consecutively (successively) in time do neither touch nor overlap.

[0050] Methods according to the invention give the swaths additional drying time compared to prior art methods before recording a touching or overlapping swath. As the drying time of a swath is used for recording other, non-touching swaths, the present print methods can achieve high printing speeds. When a swath is recorded touching or overlapping an already recorded swath, the ink of the latter swath can be dry and ink bleeding can be reduced.

[0051] Method steps are preferably iterated. A single iteration can consist of the steps for recording the first to the third swath as identified above. The third swath is then used as the starting point of a new iteration (i.e. the third swath is considered a first swath for the successive iteration step). Hence, after recording of a third swath, the medium is fed in the first direction and over the first distance. Thereafter, a new (second) swath is recorded, etc.

[0052] A single iteration can alternatively comprise steps for recording more than three swaths. In the latter case, recording of the swaths can occur with alternating feed direction as identified above.

[0053] Initialisation and/or termination steps can be applied on the methods, in which the order of recording the swaths can differ from the above iterations. In the initialisation and/or terminations steps, swaths recorded consecutively in time can touch or overlap. A wait time before recording one or more of those swaths can be used for increasing the ink drying time.

[0054] In the following preferred embodiments of the invention, aspects of the invention are applied to p-pass printing methods wherein $p \geq 1$ (p is a natural number). In case $p = 1$, this refers to a single pass printing method. In case $p > 1$, this refers to a multi-pass printing method (hence, p swaths are superposed). E.g. for $p = 2$, every pixel location on the medium is scanned two times (two swaths are superposed).

[0055] According to a first preferred embodiment, the swaths are recorded following at least in part the sequence b_i :

$$b_{2i} = b_{2i-1} - (s + 1), \quad (1)$$

$$b_{2i+1} = b_{2i} + (s + 3),$$

wherein s is an even natural number and $s \geq p$. Hence, b_{2i} refers to a second swath, recorded after the first swath b_{2i-1} and b_{2i+1} refers to a third swath, which is to be considered a first swath for the following two members of the sequence. In the above sequence, p is preferably even.

[0056] The value of b_i refers to the location on the print medium where a swath is to be recorded. The index i in b_i refers to the chronological (time) order in which the swaths are to be printed in accordance with methods of the invention. Hence, swath b_i is recorded prior (in time) to swath b_{i+1} .

[0057] The first embodiment will now be illustrated by an example. Let $p = 2$ (two-pass print method) and $s = p$. The sequence (1) then becomes:

$$b_{2i} = b_{2i-1} - 3,$$

$$b_{2i+1} = b_{2i} + 5.$$

The example is illustrated in figure 2. The order of recording swaths is: $b = n+3, n, n+5, n+2, n+7, n+4$, etc. The n -index indicates the order of occurrence of the swaths on the medium.

[0058] Before recording swath n in the above example, a backward feed has to be carried out from the position corresponding with swath $n+3$ to the position corresponding with swath n . After recording swath n , a forward feed is carried out from the position corresponding with swath n to the position corresponding with swath $n+5$, etc.

[0059] It can be seen from figure 2 that each two chronologically successive swaths do neither touch nor overlap. A single iteration step in the above example is formed by the recording of three successive swaths, e.g.: $n+3, n, n+5$. A successive iteration step starts from the third swath of the previous iteration step: $n+5, n+2, n+7$.

[0060] The above example ($s = 2$) can be applied as well to one-pass printing ($p = 1$).

[0061] It is to be noted that the number of open circles in the graphical representation of the print head in figure 2, and all following figures is not to be interpreted as a measure of the number of nozzles of the print head.

[0062] According to a second preferred embodiment, the swaths are recorded following at least in part the sequence:

$$b_1 = 1,$$

$$b_{i=m(2p+3)+2} = b_{i=m(2p+3)+1} + p + 2 \quad (2)$$

and $b_i = b_{i-2} + 1$ for the other members of the sequence. m is a natural number $= 0, 1, 2, 3, \dots$

[0063] Figure 3 illustrates the second embodiment for $p = 1$. The order of recording the swaths is: $b = n, n+3, n+1, n+4, n+2, n+5, n+8, n+6$, etc.

[0064] A single iteration step in the above example is formed by the recording of six swaths. The chronologically sixth recorded swath forms the first swath in the successive iteration step.

[0065] The second embodiment is preferably applied to p -pass print methods in which p is odd.

[0066] In the second embodiment, every third swath that is recorded is a swath that is interposed between the first and the second swath (i.e. between the two previously recorded swaths). E.g. in figure 3, swath $n+1$ is recorded after swath n and swath $n+3$.

[0067] The order of recording the swaths can follow other sequences as well, as long as they fall within scope of methods of the invention. Figure 4 illustrates a third preferred embodiment applied to a one-pass print method. The order of recording the swaths is: $n+2, n, n+3, n+1, n+6, n+4, n+7, n+5$, etc.

[0068] A single iteration step in the above example is formed by the recording of five swaths (e.g. $n+2$ to $n+6$). The chronologically fifth recorded swath (e.g. $n+6$) forms the first swath in the successive iteration step.

[0069] It can also be deduced from figure 4 that in the above example, the backward feed is of constant distance, whereas the forward feed is not.

[0070] An advantage of a constant backward feed is that the printing apparatus can be designed with a maximal backward feed specification.

[0071] As methods of the invention provide both forward and backward feeds, the positioning accuracy of the print medium with reference to the print head (or the printing apparatus) can be enhanced by performing reverse feeds (with reference to the previously executed feed direction) in two steps, as illustrated in figure 5. First, a reverse feed 54 is carried out over a larger distance (over-feed) than the target distance. Next, a forward feed 55 is carried out to position the medium relative to the print head at target location. The two-step feed arrangement allows to minimize the influence of backlash or play on print medium positioning accuracy.

[0072] Printing methods of the invention can be UV ink jet printing methods, comprising the use of ink curable by ultra-violet (UV) or actinic radiation. Such printing methods comprise a step of UV curing recorded ink, preferably directly after or during the recording of a swath.

[0073] According to a second aspect, the invention provides apparatuses for dot matrix printing. Apparatuses comprise means for carrying out methods of the invention. In particular, apparatuses comprise a print head or other means for recording swaths of ink on a medium. Print heads can refer to a scanning carriage.

[0074] Recorded swaths are oriented longitudinally along a fast scan direction (i.e. direction of translation of the print head / carriage). Apparatuses further comprise means for feeding the medium in a forward and a reverse direction with reference to the print head. The forward and reverse directions are parallel to each other and different from the fast scan direction. Said means for feeding the medium can comprise feeding means as are known in the art, such as a belt, a roll, possibly coated with grit.

[0075] Preferably, apparatuses according to the invention comprise means for UV curing recorded ink. Said means are preferably provided on the scanning carriage (e.g. a UV light source) and are preferably configured for curing recorded ink during each recording fast scan.

[0076] Methods and apparatuses for dot matrix printing of the invention allow recorded swaths for an increased ink dry time. This reduces or eliminates ink bleeding effects at the borders of touching or overlapping swaths. In case of bidirectional printing, bidirectional banding can be reduced or eliminated, because an overlapping swath is recorded when the underlying swath has had sufficient time to dry.

Claims

1. A method of dot matrix printing, wherein a print head records print data on a medium (10) in swaths by scanning the print head relative over the medium along a fast scan direction, the method comprising the steps of:

- (i) recording a first swath (11) of corresponding print data,
- (ii) feeding the medium relative to the print head in a first direction transverse to the fast scan direction and over a first distance,
- (iii) recording a second swath (12) of corresponding print data at the first distance from the first swath, wherein the first distance is such that the second swath does neither touch nor overlap the first swath,
- (iv) feeding the medium relative to the print head in a second direction and over a second distance, the second direction being the reverse of the first direction and
- (v) recording a third swath (13) of corresponding print data at the second distance from the second swath, wherein the second distance is such that the third swath does neither touch nor overlap the second swath.

2. The method according to claim 1, wherein the third swath is recorded at a location on the medium interposed between the first and the second swath.

3. The method according to claim 1 or 2, comprising iterating steps (ii) to (v).

4. The method according to claim 1 or 2, further comprising at least one sequence of a further step of feeding the medium followed by a further step of recording a swath, wherein in the further step of feeding the medium, the medium is fed in a direction being the reverse of the feeding direction in the last feeding step preceding the further step of feeding and wherein the distance over which the medium is fed in the further step of feeding is such that the swath recorded in the further step of recording does neither touch nor overlap the swath recorded in the last recording step preceding the further step of recording.

5. The method according to claim 4, comprising iterating steps (ii) to (v) and the at least one sequence.

6. The method according to any one of the claims 3 to 5, wherein the distance over which the medium is fed is equal for all feeding steps in the first and/or the second direction.

7. The method according to any one of the claims 3 to 6, wherein the distance over which the medium is fed is about equal for all feeding steps in the direction of backward feeding the medium relative to the print head.

8. The method according to any one of the preceding claims, for single or multi-pass printing wherein p swaths are superposed, $p \geq 1$ and wherein if swaths positioned consecutively on the medium are numbered with consecutive natural numbers, the chronological order of recording swaths on the medium follows at least in part the sequence:

$$\begin{aligned} b_{2i} &= b_{2i-1} - (s + 1), \\ b_{2i+1} &= b_{2i} + (s + 3), \end{aligned}$$

wherein s is an even natural number equal to or larger than p and b_i is a natural number which represents the swath recorded at position i in the sequence.

9. The method according to claim 8, wherein p is even.

10. The method according to any one of the claims 1 to 7, for single or multi-pass printing wherein p swaths are superposed, $p \geq 1$ and wherein if swaths positioned consecutively on the medium are numbered with consecutive

natural numbers, the chronological order of recording swaths on the medium follows at least in part the sequence:

$$b_1 = 1,$$

$$b_{m(2p+3)+2} = b_{m(2p+3)+1} + p + 2$$

and $b_i = b_{i-2} + 1$ for the other members of the sequence, wherein b_i represents the swath recorded at position i in the sequence and m is a natural number = 0, 1, 2, 3, ...

11. The method according to claim 10, wherein p is odd.

12. The method according to any one of the preceding claims, wherein the step of feeding in the first direction and/or the step of feeding in the second direction comprises the steps of feeding over a larger distance (54) than respectively the first or second distance followed by feeding in the reverse direction (55) to the position corresponding with respectively the first or second distance.

13. The method according to any one of the preceding claims, wherein the recording of a swath comprises curing the ink of said swath by UV radiation.

14. An apparatus for dot matrix printing comprising:

- a print head for recording swaths of ink on a medium by scanning the print head relative over the medium along a fast scan direction,
- means for feeding the medium relative to the print head in a first direction transverse to the fast scan direction and in a second direction reverse of the first direction and
- means for carrying out the method according to any one of the preceding claims.

15. The apparatus according to claim 14, comprising means for UV curing recorded ink.

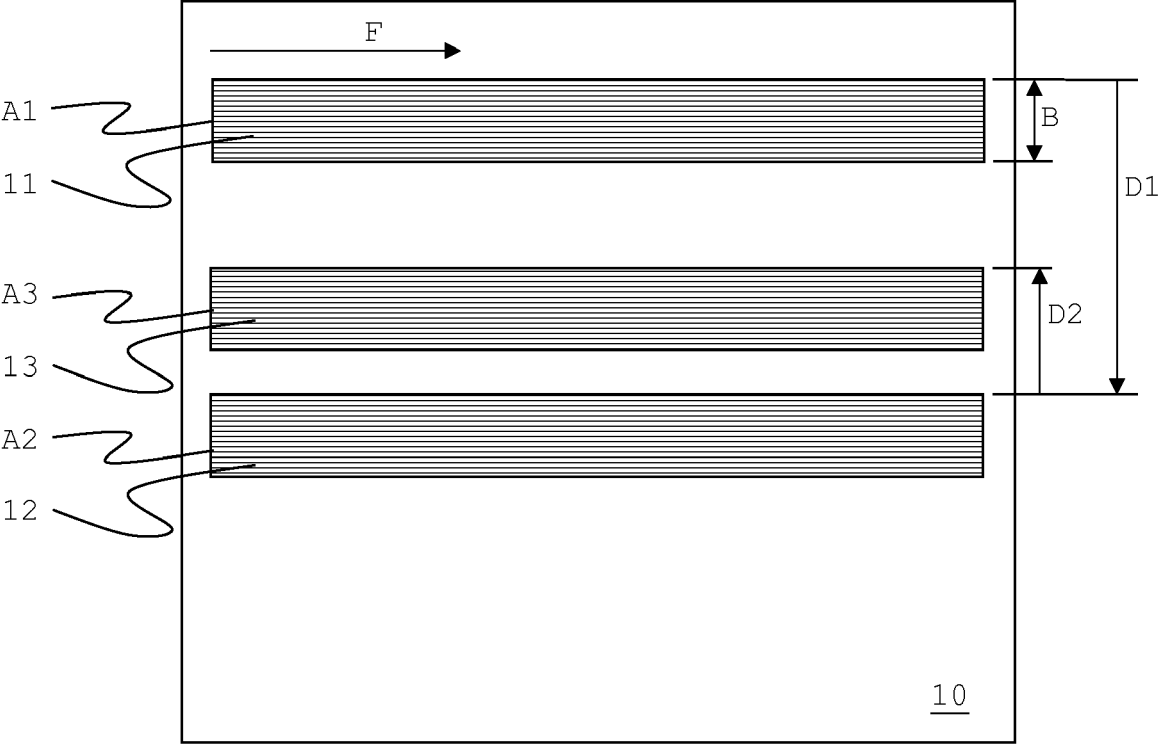


FIG 1

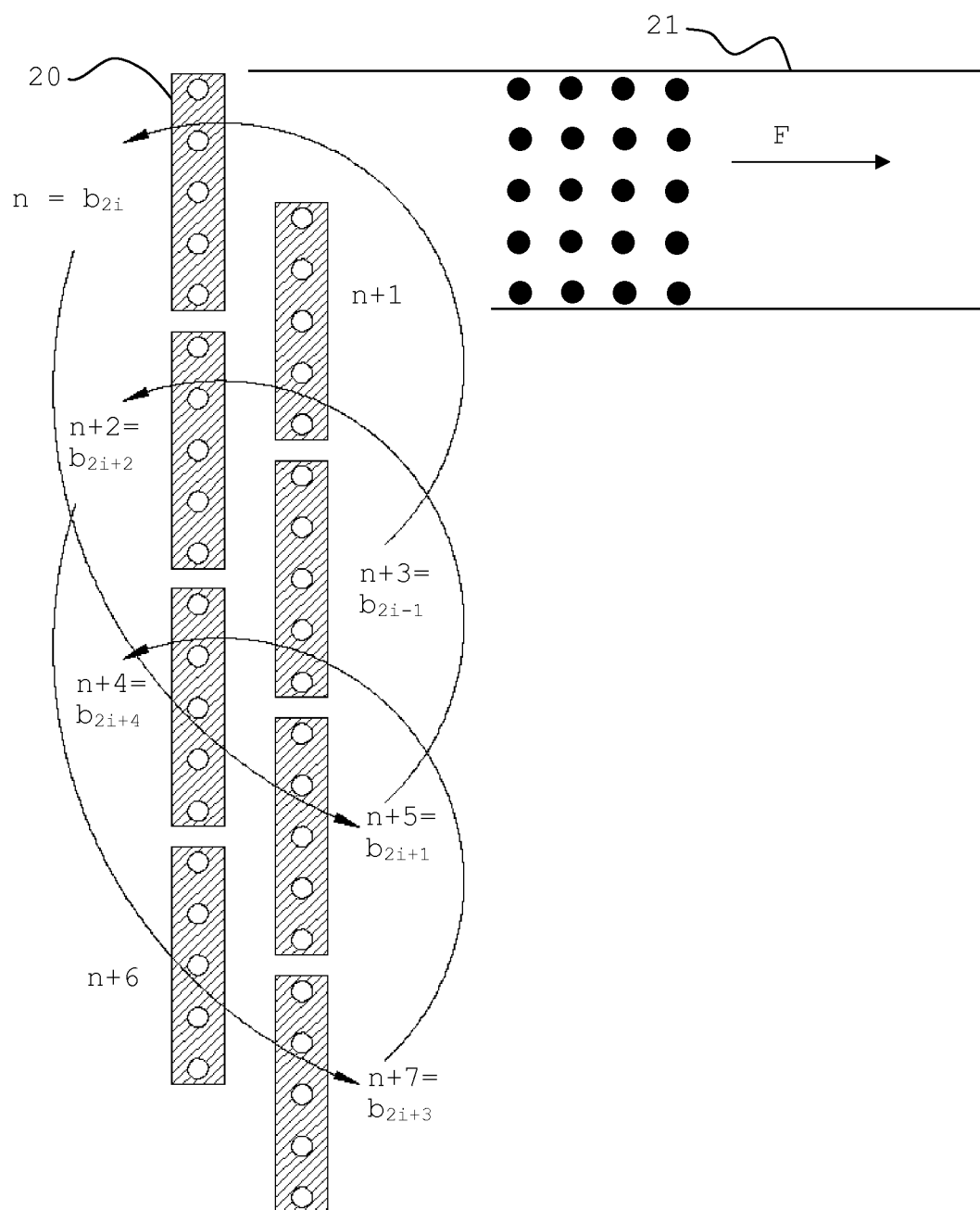


FIG 2

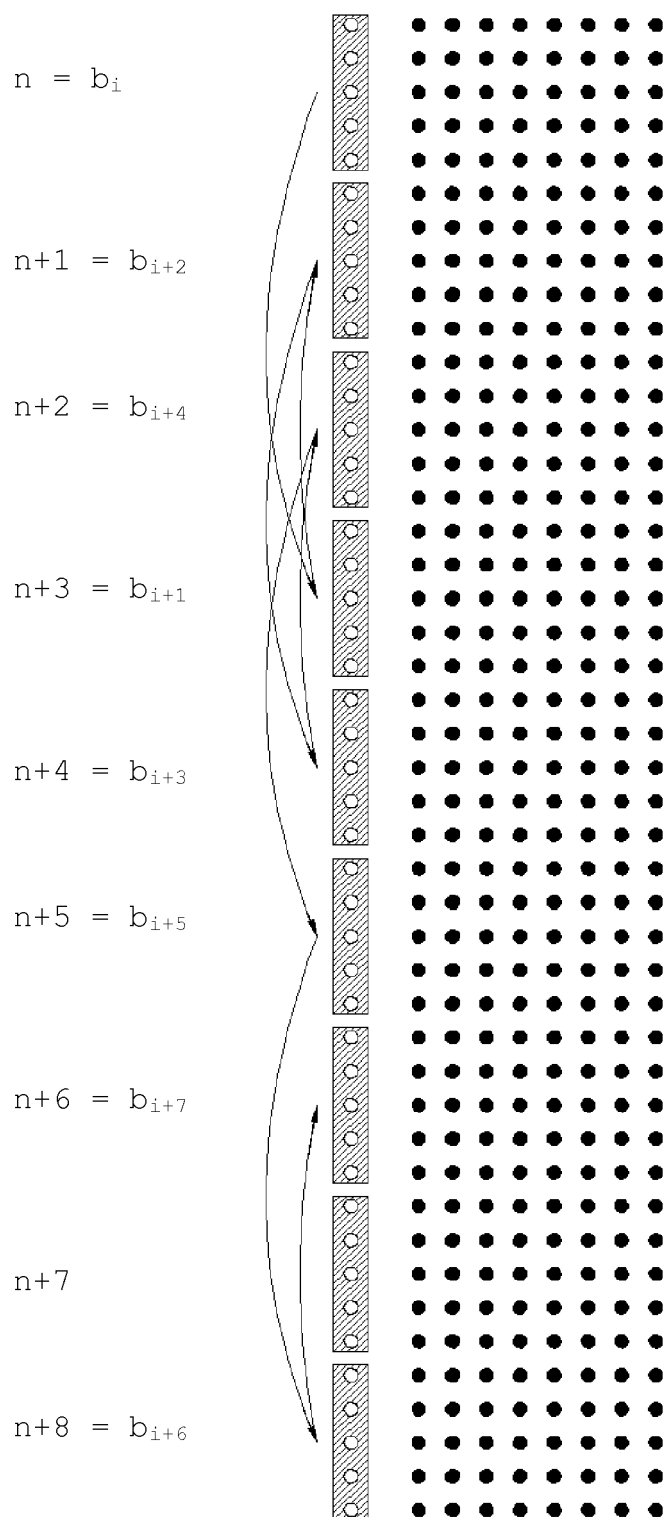


FIG 3

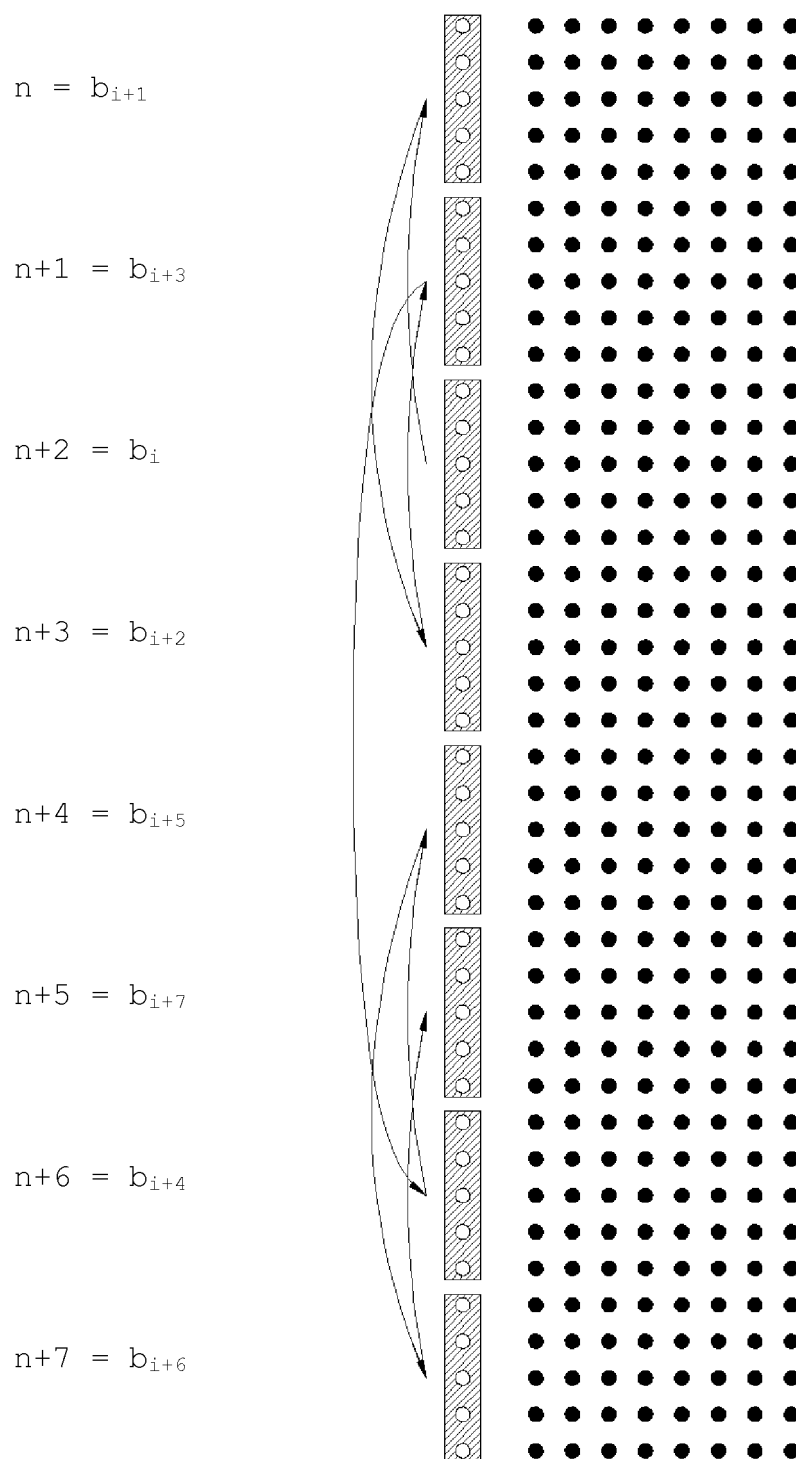


FIG 4

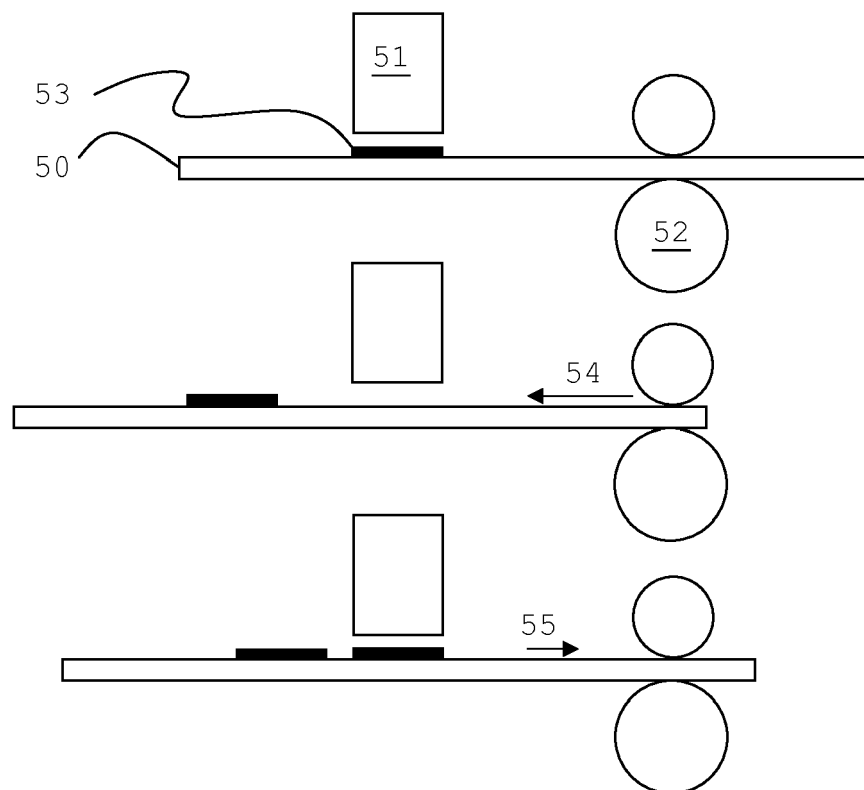


FIG 5



EUROPEAN SEARCH REPORT

Application Number
EP 08 16 9535

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 24 June 2009	Examiner De Groot, Ronald
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	

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