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(54) **Printing apparatus provided with a substantially plane printing region**

(57) In a printing apparatus, with a first apparatus (1) being provided with at least one write head (11) and a second apparatus (2) with a substantially plane printing

region (21), it is proposed for achieving a simple configuration that the first apparatus (1) and/or the second apparatus (2) are rotatably held about a rotational axis (4) substantially normal to the printing region (21).

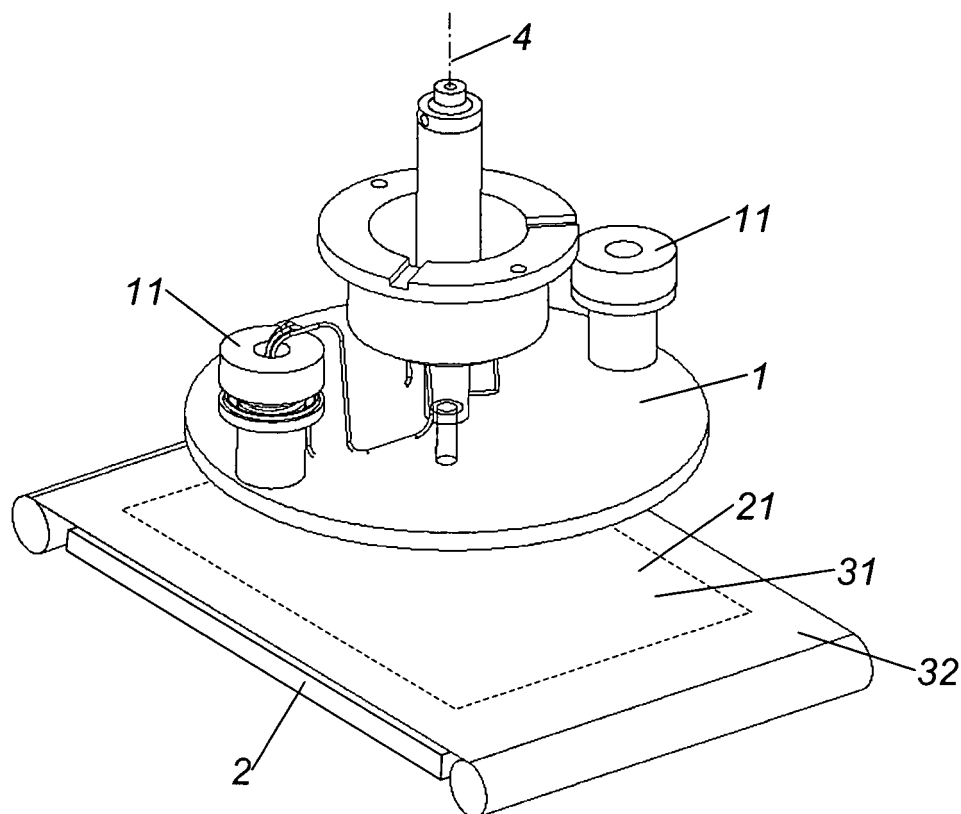


Fig. 1

Description

[0001] The invention relates to a printing apparatus, with a first apparatus being provided with at least one write head and a second apparatus with a substantially plane printing region, with the printing region being provided for receiving a paper and a printing foil.

[0002] In known such printing apparatuses, the write head comprises a laser. The laser light is deflected by an optical system when writing a line, in order to thus access all points of a line. The disadvantageous aspect is that a complex configuration is required.

[0003] It is the object of the present invention to provide a printing apparatus of the kind mentioned above with which a high printing speed can be achieved, which is of a simple configuration and can be produced in a cost-effective way.

[0004] This is achieved in accordance with the invention that the first apparatus and/or the second apparatus are rotatably held about a rotational axis substantially normal to the printing region.

[0005] This leads to the advantage that as a result of the rotation the entire printing region can be covered repeatedly in one direction, with the rotation representing an even movement. In contrast to a reciprocating carriage, there are lower stresses by accelerations, which allows providing a high printing speed. By superimposing the rotation with a translation, the entire printing region can be covered by the write head in a simple way, so that each point can be printed directly and a deflection of the write head for printing several points from one position is not required. When using a printing foil, the write head can be operated with merely one lens because it is moved by the rotational movement along a line, with the lines being curved. The length of the path of light from the write head to the printing foil can be kept short and can be achieved with merely one lens, as a result of which the losses can be kept low and high efficiency can be achieved. A uniform shape of the pixels on the entire printing region can be ensured in a simple way.

[0006] In a further development of the invention it can be provided that the printing region is provided for receiving a paper and a printing foil. In the case of a printer with a printing foil, the write head can be provided with a simple configuration, with the color flow not being influenced especially during the rotation of the printing head and an especially even printing image can be obtained.

[0007] In a further development of the invention it can be provided that the first apparatus is held in a displaceable fashion in a housing. The printable region can be composed simply by a rotation and a translation.

[0008] According to another embodiment of the invention it can be provided that the second apparatus is held in a displaceable manner in the housing. The printable region can be composed simply by a rotation and a translation.

[0009] In a further embodiment of the invention it can be provided that the write head is arranged at a distance

from the rotational axis. In the case of a rotation about the rotational axis, it is possible to print along a near-circular line or a section of a near-circular line.

[0010] According to a further development of the invention it can be provided that the write head comprises a laser, as a result of which points of the foil to be printed can be heated simply and quickly.

[0011] According to a further embodiment of the invention it can be provided that the write head is operatively connected with sliding contacts for power supply, which thus allows providing a reliable and simple power supply in a rotating first apparatus.

[0012] In a further development of the invention it can be provided that the first apparatus comprises at least two write heads, as a result of which a high writing speed and an even rotational movement of the first apparatus can be achieved in a simple way.

[0013] According to a further embodiment of the invention it can be provided that the writing head is arranged in a displaceable manner in the first apparatus. This allows achieving an especially compact configuration.

[0014] The invention is described in closer detail by reference to the enclosed drawings showing embodiments in an exemplary way, wherein:

Fig. 1 shows an oblique view of a printing apparatus in accordance with the invention;

Fig. 2 shows a conventional pixel raster, and

Figs. 3 and 4 show a modified pixel raster.

[0015] Fig. 1 shows a printing apparatus in an oblique view, comprising a first apparatus 1 with a write head 11 and a second apparatus 2 with a substantially plane printing region 21. The first apparatus 1 is rotatably held about a rotational axis 4 substantially normal to the printing region 2. The first apparatus 1 is thus rotatably held relative to the second apparatus 2. This can also be achieved in other embodiments in such a way that the second apparatus 2 is rotatably held about the rotational axis 4. In further other embodiments both the first apparatus 1 as well as the second apparatus 2 can be rotatably held. The rotational axis 4 can be held directly in a housing. In other embodiments, the rotational axis 4 can also be held in a carriage element.

[0016] The printing region 21 is provided for receiving paper 31 and a printing foil 32, with the paper 31, which is shown in Fig. 1 with the broken line, usually being arranged during the printing between the printing foil 32 and the second apparatus 2.

[0017] The distance of the write head 11 from the rotational axis 4 can be chosen in such a way that it covers the entire width of the printing region 21 during a rotation. The distance of the writing head 11 from the rotational axis 4 is larger than half of the width of the printing region 21.

[0018] The write head 11 can be rigidly joined to the

first apparatus 1. The write head 11 is guided relative to the printing region 21 along a near-circular line during a rotation of the first apparatus 1 and the second apparatus 2 about the rotational axis 4. The write head 11 is spaced from the rotational axis 4. The circular line preferably goes beyond the lateral boundaries of the printing region 21, with the distance of the write head 11 from the rotational axis 4 being larger than half the width of the printing region 21. When the printing region 21 is covered, the paper 31 can be written by means of the write head 11, with the written line being similar to a segment of a circle.

[0019] The write head 11 can preferably comprise a laser. The laser can be used to access predeterminable pixels on the printing foil 32 in a simple and quick way. A high rotational speed about the rotational axis 4 can be chosen.

[0020] The write head 11 can comprise a simple optical system, with the distance between the printing foil 32 and the writing head 11 being substantially constant for each pixel. The write head 11 can be of a simple configuration.

[0021] When the first apparatus 1 is rotatably held about the rotational axis 4, the power supply of the write head can be ensured in a simple manner in such a way that the write head 11 is operatively connected with sliding contacts.

[0022] During one rotation the writing head 11 can cover the printing region 21 twice, with the direction of coverage being substantially opposite. It can be provided that printing merely occurs during the coverage in one direction. In another embodiment it can be provided that printing occurs during each coverage.

[0023] The printing process can be accelerated when the first apparatus comprises at least two write heads 11. It is also possible that three or more write heads 11 are provided. As a result of a symmetrical arrangement of the write heads 11, the first apparatus 1 can be counter-balanced in a simple way. The occurring stresses can be kept low in a rotation of the first apparatus 1.

[0024] Moreover, the first apparatus 1 and/or the second apparatus 2 can be arranged in a displaceable manner. By superimposing the rotation about the rotational axis 4 and the translation of the first apparatus 1 and/or the second apparatus 2, the entire printing region 21 can be covered.

[0025] It can be provided during the printing process that a line feed is made between the printing of two lines in the shape of a segment of a circle. The resolution can be changed simply by controlling the speed of the forward feed and the response time of the laser depending on the rotational speed. A pixel raster according to Fig. 3 can thus be produced. A graphics is advantageously transformed prior to the printing on such a pixel raster.

[0026] It can be provided in other embodiments that the translation occurs continually and is superimposed by rotation, with the speed of the translation being chosen in such way that the forward feed between the successive start of printing of the write head 11 or the write heads 11 is precisely one line. A print raster according to Fig.

4 can thus be generated. A graphics is advantageously transformed prior to the printing on such a pixel raster.

[0027] Fig. 2 shows a pixel raster which is produced in a printer in which straight lines are printed.

[0028] The write head 11 can be arranged in another embodiment of the printing apparatus in a displaceable manner in the first apparatus. A substantially spiral pixel raster can thus be produced. In the outer region of the spiral, the distance of the write head 11 from the rotational axis 4 is preferably larger than half the width of the printing region 21.

[0029] In the case of multi-color printing, the printer foil 32 can be arranged in a first color in the printing region and the printing region can be printed with the first color, whereupon the printer foil 32 is arranged in a second color in the printing region and the printing region is printed with the second color. This process can optionally be repeated with further colors. Finally, the printer foil 32 can comprise a protective layer which can be printed on the paper.

[0030] This method seems to be especially suitable for photo printing.

[0031] A continuous movement can be achieved through rotation during the printing. Stresses as a result of accelerations as occur in reciprocating carriage elements can be substantially avoided. Since the entire printing region is covered, a complex optical system with which the laser light is deflected can be omitted and a simpler optical system can be used.

[0032] It has been seen that the invention is especially suitable for printers with a printing foil 32. It is obvious to the person skilled in the art that it is not limited to this. For example, the write heads 11 can also spray ink directly onto the printing region 21, with a separate write head 11 being provided for each color.

[0033] Further embodiments in accordance with the invention merely comprise some of the described features. Every combination of features and especially of different described embodiments can be provided.

Claims

1. A printing apparatus, with a first apparatus (1) being provided with at least one write head (11) and a second apparatus (2) with a substantially plane printing region (21), **characterized in that** the first apparatus (1) and/or the second apparatus (2) are rotatably held about a rotational axis (4) substantially normal to the printing region (21).
2. A printing apparatus according to claim 1, **characterized in that** the printing region (21) is provided for receiving a paper (31) and a printing foil (32).
3. A printing apparatus according to claim 1 or 2, **characterized in that** the first apparatus (1) is held in a displaceable manner in a housing.

4. A printing apparatus according to claim 1, 2 or 3,
characterized in that the second apparatus (2) is
held in a displaceable manner in the housing.
5. A printing apparatus according to one of the claims 1 to 4, **characterized in that** the write head (11) is
arranged at a distance from the rotational axis (4). 5
6. A printing apparatus according to one of the claims 1 to 5, **characterized in that** the write head (11) 10
comprises a laser.
7. A printing apparatus according to one of the claims 1 to 6, **characterized in that** the write head (11) is
operatively connected with sliding contacts for power supply. 15
8. A printing apparatus according to one of the claims 1 to 7, **characterized in that** the first apparatus (1)
comprises at least two write heads (11). 20
9. A printing apparatus according to one of the claims 1 to 8, **characterized in that** the write head (11) is
arranged in a displaceable manner in the first apparatus (1). 25

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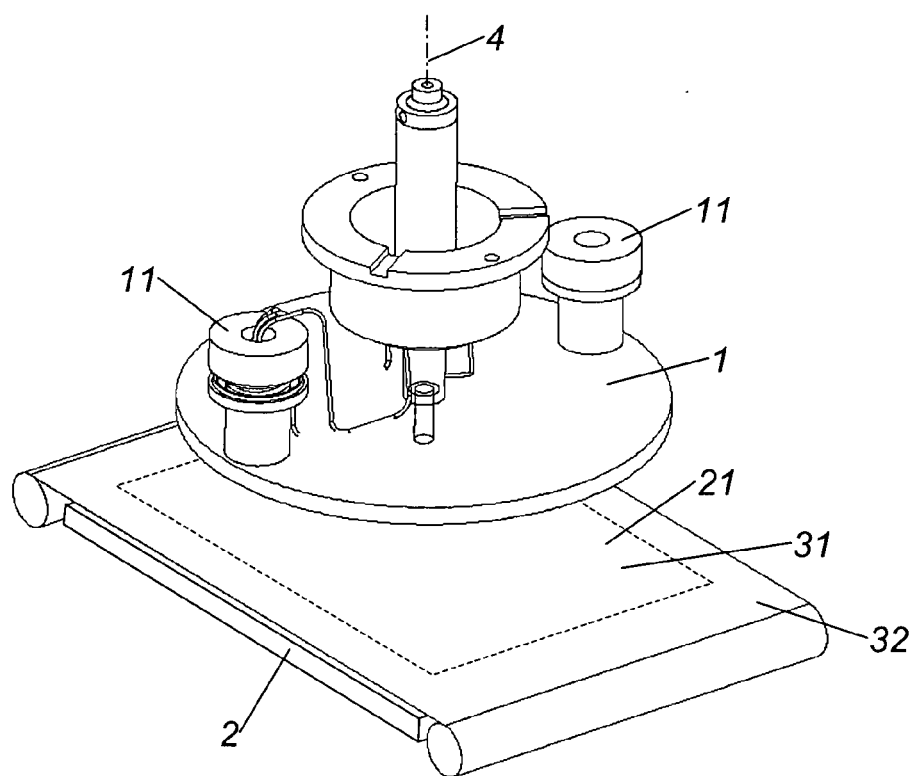


Fig. 1

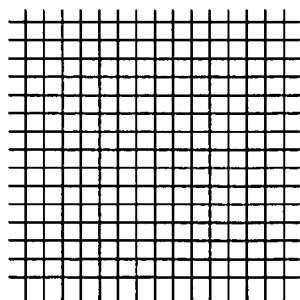


Fig. 2

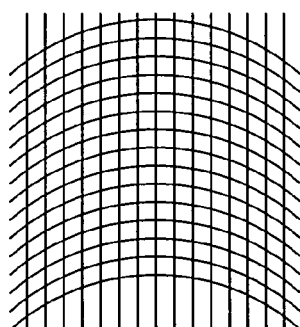


Fig. 3

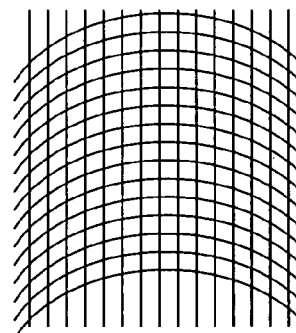


Fig. 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 06 29 0387

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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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X	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 03, 30 March 2000 (2000-03-30) -& JP 11 334121 A (MITSUBISHI ELECTRIC CORP), 7 December 1999 (1999-12-07) * abstract; figures 5a,5b,6a,6b *	1-3,9	
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			TECHNICAL FIELDS SEARCHED (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 3 August 2006	Examiner Wehr, W
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 29 0387

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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03-08-2006

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