

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
30 May 2002 (30.05.2002)

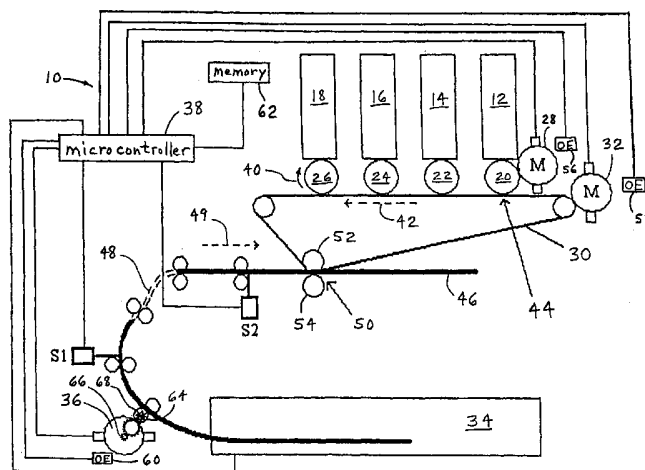
PCT

(10) International Publication Number
WO 2002/042849 A3

- (51) International Patent Classification⁷: **G03G 15/00**, 15/14
- (74) Agent: **PEZDEK, John, V.**; Lexmark International, Inc., 740 West New Circle Road, Lexington, KY 40550 (US).
- (21) International Application Number: PCT/US2001/047867
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW.
- (22) International Filing Date: 21 November 2001 (21.11.2001)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: 09/717,716 21 November 2000 (21.11.2000) US
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- (71) Applicant: **LEXMARK INTERNATIONAL, INC.** [US/US]; 740 West New Circle Road, Lexington, KY 40550 (US).
- (72) Inventors: **CHAPMAN, Danny, Keith**; 203 Old Coach Road, Nicholasville, KY 40356 (US). **MCKAY, Matthew, Lowell**; 2005 Shaker Run Road, Lexington, KY 40509 (US). **TURNEY, Steven, Michael**; 325 Meadow Valley Road, Lexington, KY 40511 (US).
- Published: — with international search report
- (88) Date of publication of the international search report: 26 February 2004

[Continued on next page]

(54) Title: METHOD AND APPARATUS FOR MINIMIZING THE OPEN LOOP PAPER POSITIONAL ERROR IN A PRINTING APPARATUS



(57) Abstract: A method of minimizing error in an estimate of a position of a sheet of print medium (46) in an electrophotographic machine (10) includes providing a transport system including a gearing system (68) to drive a roll (64) for moving the sheet of print medium along a print medium path (48). The gears are in constant mesh with each other and with an actuator (66). The electrophotographic machine is provided with a toner transfer point (50) at which the toner can be transferred to the moving sheet of print medium (46). A sensor is placed at a set distance away from the transfer nip (50) along the print medium path. This distance is approximately equal to an integer multiple of the resulting distance traveled by the medium during one revolution of the lowest frequency component of the transport system. The frequencies associated with all other components in the transport system, including the actuator (66) and an encoder wheel (60) are designed to be an integer multiple of this lowest frequency.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US01/47867

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G03G 15/00, 15/14

US CL : 399/297, 394

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)

U.S. : 399/297, 394

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

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

APS US and JPO databases

search terms: eccentric\$, interger\$, interger\$ adj2 multiples

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,310,236 A (CONNIN) 12 January 1982 (12.01.1982), column 4, line 29 - column 6, line 41.	1-21
Y	US 4,519,700 A (BARKER et al) 28 May 1985 (28.05.1985), column 3, line 50 - column 5, line 20; column 6, line 38 - column 8, line 2.	1-21
Y	US 5,455,668 A (DE BOCK et al) 03 October 1995 (03.10.1995), column 12, line 54 - column 19, line 3.	1-21
Y	US 5,642,297 A (BRADY et al) 24 June 1997 (24.06.1997), column 5, line 57 - column 8, line 14.	1-21



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	"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
"E" earlier document published on or after the international filing date	"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
"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)	"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
"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	"&" document member of the same patent family

Date of the actual completion of the international search

20 MAY 2003

Date of mailing of the international search report

09 JUN 2003

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

FRED L. BRAUN

Telephone No. (703) 308-0128

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,715,514 A (WILLIAMS et al) 03 February 1998 (03.02.1998), column 7, line 53 - column 10, line 51.	1-21
Y	US 5,794,176 A (MILILLO) 11 August 1998 (11.08.1998), column 5, line 21 - column 10, line 29.	1-21
Y	US 5,887,996 A (CASTELLI et al) 30 March 1999 (30.03.1999), column 8, line 1 - column 9, line 28.	1-21
Y	US 5,983,066 A (ABE et al) 09 November 1999 (09.11.1999), column 4, line 1 - column 7, line 55.	1-21
Y	US 5,995,802 A (MORI et al) 30 November 1999 (30.11.1999), column 15, line 44 - column 21, line 20.	1-21
Y	US 6,014,542 A (HOZUMI et al) 11 January 2000 (11.01.2000), column 4, line 13 - column 8, line 9.	1-21