(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 615 083 B9

(12) # CORRECTED EUROPEAN PATENT SPECIFICATION

(15) Correction information:
Corrected version no 1 (W1 B1)
Corrections, see
Claims EN 1, 5

(48) Corrigendum issued on:
24.02.2010 Bulletin 2010/08

(45) Date of publication and mention
of the grant of the patent:
10.09.2008 Bulletin 2008/37

(21) Application number: **05254245.3**

(22) Date of filing: **06.07.2005**

(51) Int Cl.:
G03G 15/00 *(2006.01)* ***G03G 15/01*** *(2006.01)*

(54) **Image control device for printer and method of compensating for light amount drift of photosensor used in the image control device**

Bildsteuerungsgerät für Drucker und Verfahren zur Kompensation des Lichtmengendrifts eines Leuchtdetektors

Appareil de commande d’images et méthode de compensation de dérive de quantité de lumière d’un photodetecteur

(84) Designated Contracting States:
DE FR GB NL

(30) Priority: **07.07.2004 KR 2004052599**

(43) Date of publication of application:
11.01.2006 Bulletin 2006/02

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- **PATENT ABSTRACTS OF JAPAN vol. 2003, no. 12, 5 December 2003 (2003-12-05) -& JP 2004 125986 A (CANON INC), 22 April 2004 (2004-04-22)**

Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The present invention relates to an image control device for a printer and a method of compensating for a light amount drift of a photosensor used in the image control device.

[0002] A printing machine, such as a printer or a copier, forms an electrostatic latent image by projecting an optical signal corresponding to image information onto a photosensitive medium that is charged with a uniform electrical potential using an exposing apparatus, forms a toner image by developing the electrostatic latent image using a developer, transfers the toner image to a recording medium directly or via an intermediate transfer medium, and fixes the toner image onto the recording medium by compressing and heating the toner image. In this way, the printing machine prints an image on the recording medium.

[0003] A color toner image on which yellow (Y), cyan (C), magenta (M), and black (K) toners are overlapped is thereby formed to print a color image. A printing process must be precisely controlled to form a color toner image on which color toners have been accurately overlapped to generate a high-quality image. Detection and adjustment of a color registration error is further needed to precisely control the printing process.

[0004] A color registration error is generated due to several factors, such as an error in localization of a plurality of developers that contain a plurality of color toners, an error in the manufacture of lenses used in an exposure apparatus, an error in the driving of a photosensitive medium or an intermediate transfer medium, and the like.

[0005] To generate a high-quality image, a concentration of an image must be appropriately adjusted. In other words, if an error is detected when a concentration of input image information is fully reflected in a toner image on an intermediate transfer medium, the error must be compensated for by adjusting the amount of exposed light, a developing bias applied to a developer, and the like.

[0006] In general, an image control mark including a color registration mark and an image concentration mark is formed on the intermediate transfer medium. A color registration error and an image concentration error can then be detected by detecting the image control mark using a photosensor. As shown in Figure 1, a photosensor 3 comprises a light emitting portion 1 and a light receiving portion 2. Light emitted from the light emitting portion 1 is reflected by an image concentration mark (or a color registration mark) 5, which is formed on a transfer belt 4, and incident upon the light receiving portion 2. To accurately detect an image concentration (or a color registration error), the light emitting portion 1 and the light receiving portion 2 must be provided at a precise location during production of each photosensor 3. However, in practice, the location of each of the light emitting portion 1 and the light receiving portion 2 is can vary, or drift. A location of the image concentration mark (or the color registration mark) 5 of the photosensor 3 can also vary, or drift.

[0007] When the amount of light emitted from the light emitting portion 1 is constant, the amount of light detected by the light receiving portion 2 must be constant so that the color registration error and the image concentration error can be accurately detected. A drift of the location of either the light emitting portion 1 and the light receiving portion 2 impedes an accurate detection of the color registration error and the image concentration error. Thus, precise image control is difficult.

[0008] The installation of a compensation circuit (not shown) in the photosensor 3 may be considered to compensate for a drift of the location of each of the light emitting portion 1 and the light receiving portion 2. However, this solution increases the price of the photosensor 3. Also, even if the compensation circuit is used to compensate for the drift of the location of each of the light emitting portion 1 and the light receiving portion 2, the compensation circuit cannot compensate for a drift of the location of the image concentration mark (or the color registration mark) 5.

[0009] Accordingly, a need exists for a system and method for compensating for both a drift of locations of the light emitting portion and the light receiving portion of a photosensor, and a drift of a location of an image control mark with respect to the photosensor.

[0010] EP-A-1394625 discloses a shading correction method for a sensor capable of accurately detecting color tint of a toner patch without using any white-color reference to execute shading correction in the sensor and a color image forming apparatus. In the shading correction, light reflected by a rich K toner patch formed on a transferring material is detected, a shading correction value for the sensor is calculated based on detected data, and correction is executed using the shading correction value during operation for detecting a toner patch for color stabilization.

[0011] US-A-6185386 discloses an image forming apparatus having a density compensation arrangement in which the density sensor is tuned during warm-up. A CPU successively sets ascending values of eight bits on a D/A converter so as to compare an output from the density sensor with the desired adjusting value. When the output from the density sensor is coincident with the desired adjusting value, a set value of light emission is determined and stored.

[0012] EP-A-1253482 discloses an image forming apparatus which includes an arrangement for both density and registration correction of the image.

[0013] According to the present invention there is provided an apparatus and method as set forth in the appended claims. Preferred features of the invention will be apparent from the dependent claims, and the description which follows.

[0014] The present invention aims to address the above and other problems. In one aspect, the present invention provides a method of compensating for both a drift of locations of a light emitting portion and a light receiving portion of a photosensor, and a drift of a light amount detected by the light receiving portion caused due to a drift of a location of an image control mark with respect to the photosensor.

[0015] The above and other features and advantages of the present invention will become more apparent by describing in detail exemplary embodiments thereof with reference to the attached drawings in which:

Figure 1 is a cross-section view of an example of a conventional photosensor;

Figure 2 is a construction diagram of an example of a conventional printer;

Figure 3 is a block diagram of an image control device according to an embodiment of the present invention;

Figure 4 is a plan view of an example of an image control mark according to an embodiment of the present invention; and

Figure 5 is a diagram of an example of a color registration mark according to an embodiment of the present invention.

[0016] Throughout the drawings, like reference numerals will be understood to refer to like parts, components and structures.

[0017] Referring to Figure 2, a conventional printer includes optical scan devices 10Y, 10M, 10C, and 10K, four developing cartridges 20Y, 20M, 20C, and 20K, which store yellow (Y), magenta (M), cyan (C), and black (K) toners, respectively, a transfer belt (intermediate transfer medium) 30, a transfer roller 40, and a fixing device 50. The transfer belt 30 is supported and circulated by support rollers 31, 32, and 33. A transfer drum (not shown) may be used as the intermediate transfer medium. Although not shown in detail, each of the optical scan devices 10Y, 10M, 10C, and 10K includes a polygon mirror which deflects light emitted from a light source in a main scan direction, and a reflective mirror which controls a path of the deflected light.

[0018] The optical scan device 10Y sends light corresponding to image information of a Y color over a photosensitive drum 21 of the developing cartridge 20Y that is charged with a uniform potential to form an electrostatic latent image. The Y toner contained in the developing cartridge 20Y is attached to the electrostatic latent image to form a Y toner image. The Y toner image is then transferred to the transfer belt 30.

[0019] The optical scan device 10M then sends light corresponding to image information of an M color over a photosensitive drum 21 of the developing cartridge 20M that is charged with a uniform potential to form an electrostatic latent image. The M toner contained in the developing cartridge 20M is attached to the electrostatic latent image to form an M toner image. The M toner image is then transferred to the transfer belt 30. The moment that the optical scan device 10M is to start operating is controlled so that the Y toner image already transferred to the transfer belt 30 can be accurately overlapped by the M toner image. More specifically, the moment that an operation of the optical scan device 10M is to start is controlled so that when a leading end of the Y toner image already transferred to the transfer belt 30 reaches a location (such as a transfer nip) where the photosensitive drum 21 of the developing cartridge 20M faces the transfer belt 30, a leading end of the M toner image developed by the photosensitive drum 21 of the developing cartridge 20M can also reach the transfer nip.

[0020] In a similar manner, C and K color toner images are also formed and transferred to the transfer belt 30 so that a color toner image, on which the Y, M, C, and K color toner images are overlapped, is formed on the transfer belt 30. The color toner image is then transferred onto the paper P that passes between the transfer roller 40 and the support roller 31. When the paper P passes by the fixing device 50, the color toner image is fixed onto the paper P by heat and pressure, thereby completing color printing.

[0021] In addition to the above features, an image control device in accordance with an embodiment of the present invention can be installed in the printer to control a quality of an image. As shown in Figures 3 and 4, an image control device according to an embodiment of the present invention comprises an image control mark formed on the transfer belt 30, photosensors 80s and 80e for detecting the image control mark, a correction information calculator 101, and a system controller 102. The image control mark is comprised of the image concentration mark 70 and color registration marks 60s and 60e of Figure 4.

[0022] The image concentration mark 70 is used to detect whether a concentration of input image information is fully reflected in a toner image formed on the transfer belt 30. The image concentration mark 70 may be formed on one or both sides of the transfer belt 30. As shown in Figure 4, the image concentration mark 70 comprises a plurality of gray patterns (First through N-th patterns) having different concentrations.

[0023] The color registration marks 60s and 60e are used to control the Y, M, C, and K toner images to be transferred onto the transfer belt 30 in such a way that the toner images are accurately overlapped one upon another. Referring to Figure 4, the color registration marks 60s and 60e are formed on side portions of the transfer belt 30. An embodiment of the color registration marks 60s and 60e is shown in greater detail in Figure 5. Referring to Figure 5, the color registration marks 60s and 60e are arranged on both side portions of the transfer belt 30 in a main scan direction X. Each of the color registration marks 60s and 60e comprises Y, M, C, and K components 61 in the main scan direction X, and Y, M, C, and K components 62 in an aslant direction.

[0024] Referring back to Figure 3, the photosensors 80s and 80e are installed over the transfer belt 30 and detect the image concentration mark 70 and the color registration marks 60s and 60e. The photosensors 80s and 80e of Figure 3 may be constructed substantially the same as the photosensor 3 of Figure 1, including the light emitting portion 1 and the light receiving portion 2. The correction information calculator 101 calculates color registration correction information and image concentration correction information from an optical signal that is reflected by the color registration marks 60s and 60e and the image concentration mark 70, and subsequently detected by the light receiving potion 2. The system controller 102 receives the color registration correction information and the image concentration correction information, and controls the printer accordingly. More specifically, based on the color registration correction information and the image concentration correction information, the system controller 102 controls system control elements, such as the starting time of the optical scan devices 10Y, 10M, 10C, and 10K, a driving speed of the transfer belt 30, a development voltage applied to the developing cartridges 20Y, 20M, 20C, and 20K to attach toners onto the photosensitive drums 21, a transfer voltage used to transfer toner images on the photosensitive drums 21 to the transfer belt 30, and the like.

[0025] Optical signals reflected by the image concentration marks 70 and detected by the light receiving portions 2 of the photosensors 80s and 80e pass through first and third amplifiers 121 and 123 as described in greater detail below, and also pass through second and fourth amplifiers 122 and 124, respectively. After passing through the second and fourth amplifiers 122 and 124, the optical signals are passed through an analog-to-digital converter (ADC) 150 and are then input to the correction information calculator 101. The correction information calculator 101 calculates the image concentration correction information from a difference between a detected concentration value calculated from a level of a signal received from the ADC 150, and a reference concentration value pre-stored, for example, in a memory 105. The system controller 102 then controls system control elements, such as a developing voltage, a transfer voltage, and the like, based on the image concentration correction information.

[0026] As noted above, the optical signals reflected by the color registration marks 60s and 60e and detected by the light receiving portions 2 of the photosensors 80s and 80e also pass through first and third amplifiers 121 and 123, respectively, and are then input to first and second comparators 131 and 132, respectively. The optical signals comprise, for example, voltage signals that are proportional to a detected amount of light. A digital-to-analog converter (DAC) 160 converts a threshold value that is pre-stored in the memory 105 into a threshold voltage and provides the threshold voltage to the first and second comparators 131 and 132. The first and second comparators 131 and 132 compare the voltage signals with the threshold voltage. If the voltage signals are higher than the threshold voltage, the first and second comparators 131 and 132 output high (H) signals. If the voltage signals are lower than the threshold voltage, the first and second comparators 131 and 132 output low (L) signals. The output signals of the first and second comparators 131 and 132 are input to a count register 140. If the color registration marks 60s and 60e are detected and the first and second comparators 131 and 132 output L signals, the count register 140 counts a time interval between the L signals.

[0027] Accordingly, as shown in Figure 5, time intervals txs1, txs2, txs3, and txs4 between the first, second, third, and fourth color marks Y, M, C, and K components of 61 and 62 in the main scan direction X and in the aslant direction of the color registration mark 60s are detected. Time intervals tys12, tys13, and tys14 between the first and second color marks Y and M components of 61, between the first and third color marks Y and C components of 61, and between the first and fourth color marks Y and K components of 61, respectively, are also detected. Time intervals txe1, txe2, txe3, and txe4 between the first, second, third, and fourth color marks Y, M, C, and K components of 61 and 62 in the main scan direction X and in the aslant direction of the color registration mark 60e are also detected. Time intervals tye12, tye13, and tye14 between the first and second color marks Y and M components of 62, between the first and third color marks Y and C components of 62, and between the first and fourth color marks Y and K components of 62, respectively, are also detected.

[0028] Examples of the color registration correction information comprise an X offset, a Y offset, a printing width error, and a skew error. The correction information calculator 101 calculates the color registration correction information, namely, the X offset, the Y offset, the printing width error, and the skew error, based on relational expressions as shown in Table 1. In Table 1, Ty2, Ty3, and Ty4 denote reference values of time intervals between the first and second color marks Y and M components of 61, between the first and third color marks Y and C components of 61, and between the first and fourth color marks Y and K components of 61, respectively.

Table 1

	X-OFFSET	Y-OFFSET	Printing width error	Skew error
M color	txs1-txs2	Ty2-tys12	(txs1-txe1)-(txs2-txe2)	tys12-tye12
C color	txs1-txs3	Ty3-tys13	(txs1-txe1)-(txs3-txe3)	tys13-tye13

(continued)

	X-OFFSET	Y-OFFSET	Printing width error	Skew error
K color	txs1-txs4	Ty4-tys14	(txs1-txe1)-(txs4-txe4)	tys14-tye14

[0029] The system controller 102 controls the printer to compensate for the X offset, the Y offset, the printing width error, and the skew error. The X offset of the second color mark M is an error in the main scan direction X. If the X offset of the second color mark M is negative, the second color mark M is shifted in -X direction. If the X offset of the second color mark M is positive, the second color mark M is shifted in +X direction. The system controller 102 controls the optical scan device 10M so that a scan line of the optical scan device 10M is moved in the +X or -X direction. An example of a method of compensating for an X offset will now be described in greater detail.

[0030] The system controller 102 has a left margin register value to determine a left margin of printing areas, namely, pages 1, 2, and 3. The system controller 102 adjusts the X offset by controlling the moment that the optical scan device 10M starts main scanning based on the left margin register value. If a basic value of the left margin register value is 500 for example, the system controller 102 sets a left margin register value to be, for example, 400 or 600, to compensate for the detected X offset. If the left margin register value is set to be 400, a location where the optical scan device 10M starts scanning is moved by 100 dots in the -X direction. If the left margin register value is set to be 600 for example, a location where the optical scan device 10M starts scanning is moved by 100 dots in the +X direction. This method is similarly used to compensate for the X offsets of the third and fourth color marks C and K.

[0031] A negative Y offset denotes a page delay, so an error in a sub-scan direction can be reduced by advancing a page. A positive Y offset denotes a page advance, so the error in the sub-scan direction can be reduced by delaying a page. An example of a method of compensating for a Y offset will now be described in greater detail.

[0032] The system controller 102 has a top margin register value to determine a top margin of printing areas, namely, pages 1, 2, and 3. The system controller 102 adjusts the Y offset by controlling the moment that the optical scan device 10M starts main scanning based on the top margin register value. If a basic value of the top margin register value is 100 for example, the system controller 102 sets a top margin register value to be, for example, 120 or 80, to compensate for the detected Y offset. If the top margin register value is set to be 120 for example, the optical scan device 10M is delayed by 20 dots and then starts scanning. Hence, a page is moved by 20 dots in -Y direction. If the top margin register value is set to be 80 for example, the optical scan device 10M is advanced by 20 dots and starts scanning. Hence, a page is moved by 20 dots in the +Y direction. This method is similarly used to compensate for the Y offsets of the third and fourth color marks C and K.

[0033] If a printing width error has a negative value, a distance in the main scanning direction X between the second color marks M of the color registration marks 60s and 60e, is greater than a distance in the main scanning direction X between the first color marks Y of the color registration marks 60s and 60e. In this case, a printing width needs to be reduced. If a printing width error has a positive value, a printing width needs to be increased. An example of a method of compensating for a printing width error will now be described in greater detail.

[0034] The printing width error is compensated for by controlling a scan speed. A scan speed of the optical scan device 10M depends on a rotating speed of a polygon mirror (not shown) and a clock frequency of an image information signal. If the time required to scan a single dot is basically 100 ns for example, the time is increased to, for example, 120 ns, to increase the printing width. To increase the time to 120 ns, the clock frequency of the image information signal is set to be 1/120 ns, and the rotating speed of the polygon mirror is decreased in proportion to the 1/120 ns clock frequency. The time required to scan a single dot is set to, for example, 80 ns, to decrease the printing width. To decrease the time to 80ns, the clock frequency of the image information signal is set to be 1/80 ns, and the rotating speed of the polygon mirror is increased in proportion to the 1/80 ns clock frequency.

[0035] Even when the three errors (X offset, Y offset, and printing width errors) are not generated, a skew, in which main scan lines are inclined due to scan errors or the like of the optical scan devices 10Y, 10M, 10C, and 10K, may be generated. If the skew error has a negative value, a skew in which the main scan lines are inclined in the -Y direction when going in the +X direction is generated. However, if the skew error has a positive value, a skew in which the main scan lines are inclined in the +Y direction when going in the +X direction is generated. Generally, the skew error cannot be compensated for during printing. During the manufacture of a printer, angles at which reflective mirrors are installed within the optical scan devices 10Y, 10M, 10C, and 10K are controlled to measure a skew error and compensate for the measured skew error.

[0036] Although the amount of light emitted from the light emitting portions 1 of each of the photosensors 80s and 80e is preferably constant, a variation or drift of the amount of the emitted light may be generated, such as due to manufacturing tolerances of the photosensors 80s and 80e. When the photosensors 80s and 80e are installed, they may be inclined or drift thereby affecting a distance (L) between each of the photosensors 80s and 80e and the transfer belt 30 as indicated by a dotted line of Figure 1. Even if a driving current value input to the light emitting portion 1 is constant, these drifts may cause a drift of the amount of light detected by the light receiving portion 2 (hereinafter, referred to as a light amount drift). The light amount drift causes color registration correction information and image concentration correction information to be inaccurately calculated.

[0037] To prevent this problem, the image control device according to an embodiment of the present invention further comprises a light amount drift calculator 103 for calculating a light amount drift, and a light emission driver 104 for controlling the amount of light emitted from the light emitting portion 1 of each of the photosensors 80s and 80e based on the calculated light amount drift. To compensate for the light amount drift, the image control device detects the amount of light reflected by the transfer belt 30 instead of forming a special light amount drift correction pattern on the transfer belt 30. The image control device then compensates for the light amount drift by controlling the amount of light emitted from the light emitting portion 1.

[0038] A method of compensating for a light amount drift of a photosensor will now be described in greater detail. The image control device compensates for the light amount drift of each of the photosensors 80s and 80e before detecting an image control mark and calculating image correction information. The light emitting portion 1 of each of the photosensors 80s and 80e projects light onto the transfer belt 30, and the light receiving portion 2 thereof detects an optical signal reflected by the transfer belt 30. The optical signal is input to the ADC 150 via the second and fourth amplifiers 122 and 124. A signal output by the ADC 150 is input to the light amount drift calculator 103. The light amount drift calculator 103 calculates a light amount from a level of the signal received from the ADC 150 and compares the calculated light amount with a reference light amount pre-set in the memory 105 to calculate a light amount drift. To compensate for the light amount drift, the light amount drift calculator 103 outputs a light emission control signal for controlling the amount of light emitted from the light emitting portion 1. The light emission driver 104 controls the amount of light emitted from the light emitting portion 1 by increasing or decreasing a current value supplied to the light emitting portion 1 according to the received light emission control signal. This process repeats until the amount of light that is reflected by the transfer belt 30 and detected by the light receiving portion 2 is substantially the same as a reference light amount.

[0039] As described above, in an image control device and method of compensating for a light amount drift of a photosensor used in the image control device according to the present invention, a light amount drift due to a drift of the amount of light emitted from a light emitting portion of the photosensor, a light amount drift due to a drift of the location of each of the light emitting portion and a light receiving portion of the photosensor, and a light amount drift due to a drift of the location of the photosensor, can all be effectively compensated. Further, the precision required to manufacture the photosensor can be lowered, and the price of the photosensor can be further reduced as a compensation circuit is no longer required.

[0040] Although a few preferred embodiments have been shown and described, it will be appreciated by those skilled in the art that various changes and modifications might be made without departing from the scope of the invention, as defined in the appended clams.

Claims

1. A method of compensating for a light amount drift of a photosensor (80s, 80e) used in an image control device, the photosensor (80s, 80e) including a light emitting portion (1) and a light receiving portion (2) for projecting light onto at least one of an intermediate transfer medium (30) and an image control mark (60,70) formed on an intermediate transfer medium (30) of a printer and detecting an optical signal reflected so as to control a quality of an image, the method comprising:

projecting light on the intermediate transfer medium (30);
detecting an amount of light reflected by the intermediate transfer medium (30);
comparing the detected light amount with a pre-set reference light amount to calculate the light amount drift;
outputting a light emission control signal for controlling the amount of light emitted from the light emitting portion (1); and
correcting the detected light amount by controlling the amount of light projected on the intermediate transfer medium (30) by increasing or decreasing a current value supplied to the light emitting portion (1) according to the received light emission control signal , so that the detected light amount is substantially equal to the pre-set reference light amount.

2. The method of claim 1, further comprising the step of:

controlling the amount of light projected on the intermediate transfer medium (30) by controlling the amount of light emitted from the light emitting portion (1).

3. The method of claim 1 or 2, wherein the image control mark (60,70) comprises an image concentration mark (70) for controlling an image concentration.

4. The method of claim 3, further comprising the steps of:

providing the image control mark (60,70) as a plurality of color registration marks (60s, 60e) formed on both side portions of the intermediate transfer medium (30);
detecting the color registration marks (60s, 60e) for calculating at least one offset error; and
correcting a toner transfer upon the intermediate transfer medium (30) based upon the offset error.

5. An image control device for a printer, comprising:

an image control mark (60,70) formable on an intermediate transfer medium (30) of the printer;
a photosensor (80s, 80e) installable over the intermediate transfer medium (30) and comprising a light emitting portion (1) adapted to project light onto at least one of the intermediate transfer medium (30) and the image control mark (60,70), and a light receiving portion (2) adapted to receive light reflected by the image control mark (60,70) and the intermediate transfer medium (30);
a correction information calculator (101) adapted to calculate image correction information from an optical signal that is reflected by the image control mark (60,70) and detected by the light receiving portion;
a system controller (102) adapted to receive the image correction information and control the printer based on the image correction information;
a light amount drift calculator (103) adapted to calculate a light amount drift by comparing a light amount that is reflected by the intermediate transfer medium (30) and detected by the light receiving portion (2) with a preset reference light amount, and adapted to output a light emission control signal for controlling the amount of light emitted from the light emitting portion (1) ; and
a light emission driver (104) adapted to control an amount of light emitted from the light emitting portion (1), by increasing or decreasing a current value supplied to the light emitting portion (1) according to the received light emission control signal.

6. The image control device of claim 5, wherein the image control mark (60,70) comprises an image concentration mark (70) for controlling an image concentration.

7. The image control device of claim 6, wherein:

the image control mark (60,70) further comprises a plurality of color registration marks (60s, 60e) formable on both side portions of the intermediate transfer medium (30); and
the photosensor (80s, 80e) is configurable to detect the image concentration mark (70) and the color registration marks (60s, 60e).

Patentansprüche

1. Verfahren zum Kompensieren einer Lichtmengendrift eines Fotosensors (80s, 80e), der in einer Bildsteuervorrichtung verwendet wird und der einen Lichtemissionsabschnitt (1) und einen Lichtempfangsabschnitt (2) zum Projizieren von Licht auf ein Zwischenübertragsungsmedium (30) und/oder auf eine auf einem Zwischenübertragungsmedium (30) eines Druckers ausgebildete Bildsteuermarkierung (60, 70) und zum Erfassen eines reflektierten optischen Signals aufweist, um die Bildqualität zu steuern, umfassend:

Projizieren von Licht auf das Zwischenübertragungsmedium (30);
Erfassen einer von dem Zwischenübertragungsmedium (30) reflektierten Lichtmenge;
Vergleichen der erfassten Lichtmenge mit einer vorgegebenen Bezugslichtmenge zum Berechnen der Lichtmengendrift;
Ausgeben eines Lichtemissionssteuersignals zum Steuern der von dem Lichtemissionsabschnitt (1) abgegebenen Lichtmenge; und
Korrigieren der erfassten Lichtmenge durch Steuern der auf das Zwischenübertragungsmedium (30) projizierten Lichtmenge durch Vergrößern oder Verkleinern einer Stromgröße, die dem Lichtemissionsabschnitt (1) zugeführt wird, entsprechend dem empfangenen Lichtemissionssteuersignal, so dass die erfasste Lichtmenge im Wesentlichen gleich der vorgegebenen Bezugslichtmenge ist.

2. Verfahren nach Anspruch 1, ferner enthaltend den Schritt:

   Steuern der auf das Zwischenübertragungsmedium (30) projizierten Lichtmenge durch Steuern der von dem Lichtemissionsabschnitt (1) abgegebenen Lichtmenge.

3. Verfahren nach Anspruch 1 oder 2, bei dem die Bildsteuermarkierung (60,70) eine Bildkonzentrationsmarkierung (70) zum Steuern einer Bildkonzentration enthält.

4. Verfahren nach Anspruch 3, weiterhin enthaltend die Schritte:

   Bereitstellen der Bildsteuermarkierung (60,70) als eine Vielzahl von Farbpassermarken (60s,60e), die auf beiden Seitenabschnitten des Zwischenübertragungsmediums (30) ausgebildet sind;
   Erfassen der Farbpassermarken (60s, 60e) zum Berechnen wenigstens eines Versatzfehlers; und
   Korrigieren einer Tonerübertragung auf das Zwischenübertragungsmedium (30) auf der Grundlage des Versatzfehlers.

5. Bildsteuervorrichtung für einen Drucker, enthaltend:

   eine Bildsteuermarkierung (60,70), die auf einem Zwischenübertragungsmedium (30) des Druckers ausbildbar ist;
   einen Fotosensor (80s,80e), der über dem Zwischenübertragungsmedium (30) installierbar ist und einen Lichtemissionsabschnitt (1) enthält, der dazu eingerichtet ist, Licht auf das Zwischenübertragungsmedium (30) und/oder die Bildsteuermarkierung (60,70) zu projizieren, und einen Lichtempfangsabschnitt (2), der dazu eingerichtet ist, von der Bildsteuermarkierung (60,70) und dem Zwischenübertragungsmedium (30) reflektiertes Licht aufzunehmen;
   einen Korrekturinformationsrechner (101), der dazu eingerichtet ist, Bildkorrekturinformation aus einem optischen Signal zu berechnen, das von der Bildsteuermarkierung (60,70) reflektiert und von dem Lichtempfangsabschnitt erfasst wird;
   eine Systemsteuereinheit (102), die dazu eingerichtet ist, die Bildkorrekturinformation zu empfangen und den Drucker auf der Grundlage der Bildkorrekturinformation zu steuern;
   einen Lichtmengendriftrechner (103), der dazu eingerichtet ist, eine Lichtmengendrift durch Vergleichen einer von dem Zwischenübertragungsmedium (30) reflektierten und von dem Lichtempfangsabschnitt (2) erfassten Lichtmenge mit einer vorgegebenen Bezugslichtmenge zu berechnen und dazu eingerichtet ist, ein Lichtemissionssteuersignal zum Steuern der von dem Lichtemissionsabschnitt (1) abgegebenen Lichtmenge abzugeben; und
   einen Lichtemissionstreiber (104), der dazu eingerichtet ist, eine von dem Lichtemissionsabschnitt (1) abgegebene Lichtmenge durch Vergrößern oder Verkleinern einer dem Lichtemissionsabschnitt (1) zugeführten Stromgröße entsprechend dem empfangenen Lichtemissionssteuersignal zu steuern.

6. Bildsteuervorrichtung nach Anspruch 5, bei der die Bildsteuermarkierung (60,70) eine Bildkonzentrationsmarkierung (70) zum Steuern einer Bildkonzentration enthält.

7. Bildsteuervorrichtung nach Anspruch 6, bei der:

   die Bildsteuermarkierung (60,70) weiterhin mehrere Farbpassermarken (60s,60e) umfasst, die auf beiden Seitenabschnitten des Zwischenübertragungsmediums (30) ausbildbar sind; und
   der Fotosensor (80s,80e) dazu konfigurierbar ist, die Bildkonzentrationsmarkierung (70) und die Farbpassermarken (60s,60e) zu erfassen.

Revendications

1. Procédé de compensation d'une dérive de quantité de lumière d'un photocapteur (80s, 80e) utilisé dans un dispositif de commande d'image, le photocapteur (80s, 80e) comprenant une partie photo-émettrice (1) et une partie photoréceptrice (2) pour projeter de la lumière sur au moins un support de transfert intermédiaire (30) et une marque de commande d'image (60,70) formée sur un support de transfert intermédiaire (30) d'une imprimante et détecter un signal optique réfléchi afin de commander la qualité d'une image, le procédé comprenant :

la projection de lumière sur le support de transfert intermédiaire (30) ;
la détection d'une quantité de lumière réfléchie par le support de transfert intermédiaire (30) ;
la comparaison de la quantité de lumière détectée avec une quantité de lumière de référence prédéfinie pour calculer la dérive de quantité de lumière ;
la délivrance d'un signal de commande d'émission de lumière pour commander la quantité de lumière émise par la partie photo-émettrice (1) ; et
la correction de la quantité de lumière détectée en commandant la quantité de lumière projetée sur le support de transfert intermédiaire (30) en augmentant ou en diminuant une valeur de courant fournie à la partie photo-émettrice (1) selon le signal de commande d'émission de lumière reçue, de sorte que la quantité de lumière détectée soit sensiblement égale à la quantité de lumière de référence prédéfinie.

2. Procédé selon la revendication 1, comprenant en outre l'étape consistant à :

commander la quantité de lumière projetée sur le support de transfert intermédiaire (30) en commandant la quantité de lumière émise par la partie photo-émettrice (1).

3. Procédé selon la revendication 1 ou 2, dans lequel la marque de commande d'image (60, 70) comprend une marque de concentration d'image (70) pour commander une concentration d'image.

4. Procédé selon la revendication 3, comprenant en outre les étapes consistant à :

fournir la marque de commande d'image (60, 70) sous la forme d'une pluralité de marques d'enregistrement de couleurs (60s, 60e) formées sur les deux parties latérales du support de transfert intermédiaire (30) ;
détecter les marques d'enregistrement de couleurs (60s, 60e) pour calculer au moins une erreur de décalage ; et
corriger un transfert de toner sur le support de transfert intermédiaire (30) en se basant sur l'erreur de décalage.

5. Dispositif de commande d'image pour une imprimante, comprenant :

une marque de commande d'image (60,70) qui peut être formée sur un support de transfert intermédiaire (30) de l'imprimante ;
un photocapteur (80s, 80e) qui peut être installé sur le support de transfert intermédiaire (30) et comprenant une partie photo-émettrice (1) adaptée pour projeter de la lumière sur au moins l'un du support de transfert intermédiaire (30) et de la marque de commande d'image (60, 70), et une partie photoréceptrice (2) adaptée pour recevoir de la lumière réfléchie par la marque de commande d'image (60, 70) et le support de transfert intermédiaire (30) ;
un calculateur d'informations de correction (101) adapté pour calculer des informations de correction d'image à partir d'un signal optique qui est réfléchi par la marque de commande d'image (60, 70) et détecté par la partie photo-réceptrice ;
un dispositif de commande de système (102) adapté pour recevoir les informations de correction d'image et commander l'imprimante en se basant sur les informations de correction d'image ;
un calculateur de dérive de quantité de lumière (103) adapté pour calculer une dérive de quantité de lumière en comparant la quantité de lumière réfléchie par le support de transfert intermédiaire (30) et détectée par la partie photo-réceptrice (2) avec une quantité de lumière de référence prédéfinie en augmentant ou en diminuant une valeur de courant fournie à la partie photo-émettrice (1) selon le signal de commande d'émission de lumière reçu, et
un excitateur d'émission de lumière (104) adapté pour commander une certaine quantité de lumière émise par la partie photo-émettrice, et adapté pour délivrer un signal de commande d'émission de lumière pour commander la quantité de lumière émise par la partie photo-émettrice (1).

6. Dispositif de commande d'image selon la revendication 5, dans lequel la marque de commande d'image (60, 70) comprend une marque de concentration d'image (70) pour commander une concentration d'image.

7. Dispositif de commande d'image selon la revendication 6, dans lequel :

la marque de commande d'image (60, 70) comprend en outre une pluralité de marques d'enregistrement de couleurs (60s, 60e) qui peuvent être formées sur les deux parties latérales du support de transfert intermédiaire (30) ; et
le photocapteur (80s, 80e) peut être configuré pour détecter la marque de concentration d'image (70) et les

marques d'enregistrement de couleurs (60s, 60e).

FIG. 1

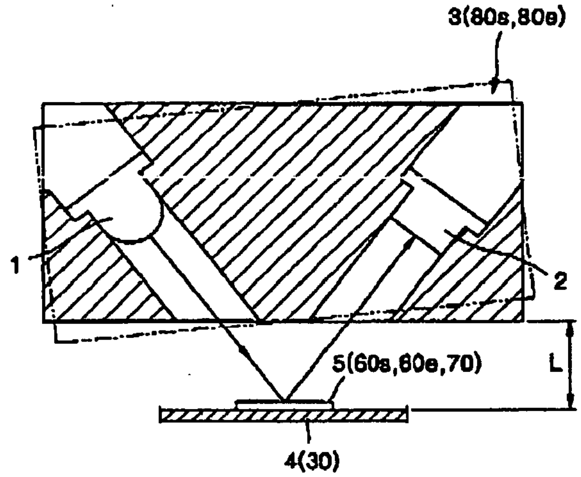


FIG. 2

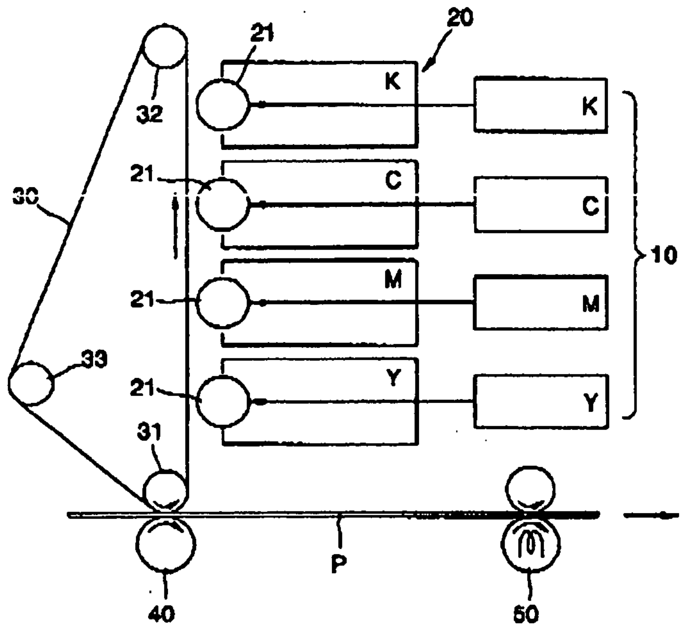


FIG. 3

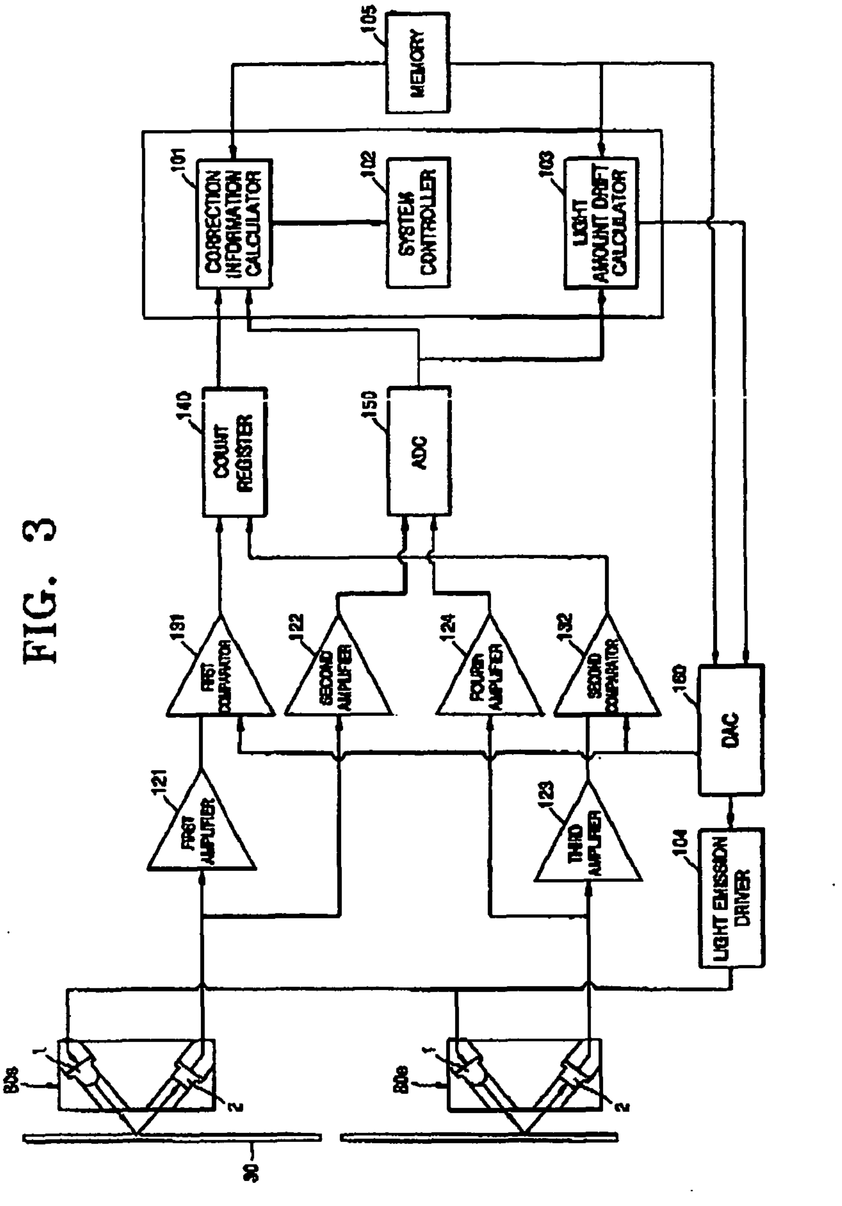

105
MEMORY
101
CORRECTION INFORMATION CALCULATOR
102
SYSTEM CONTROLLER
103
LIGHT AMOUNT DRIFT CALCULATOR
140
COUNT REGISTER
150
ADC
FIRST COMPARATOR
122
SECOND AMPLIFIER
124
132
SECOND COMPARATOR
121
FIRST AMPLIFIER
123
THIRD AMPLIFIER
160
DAC
104
LIGHT EMISSION DRIVER
80a
1
2
30

FIG.4

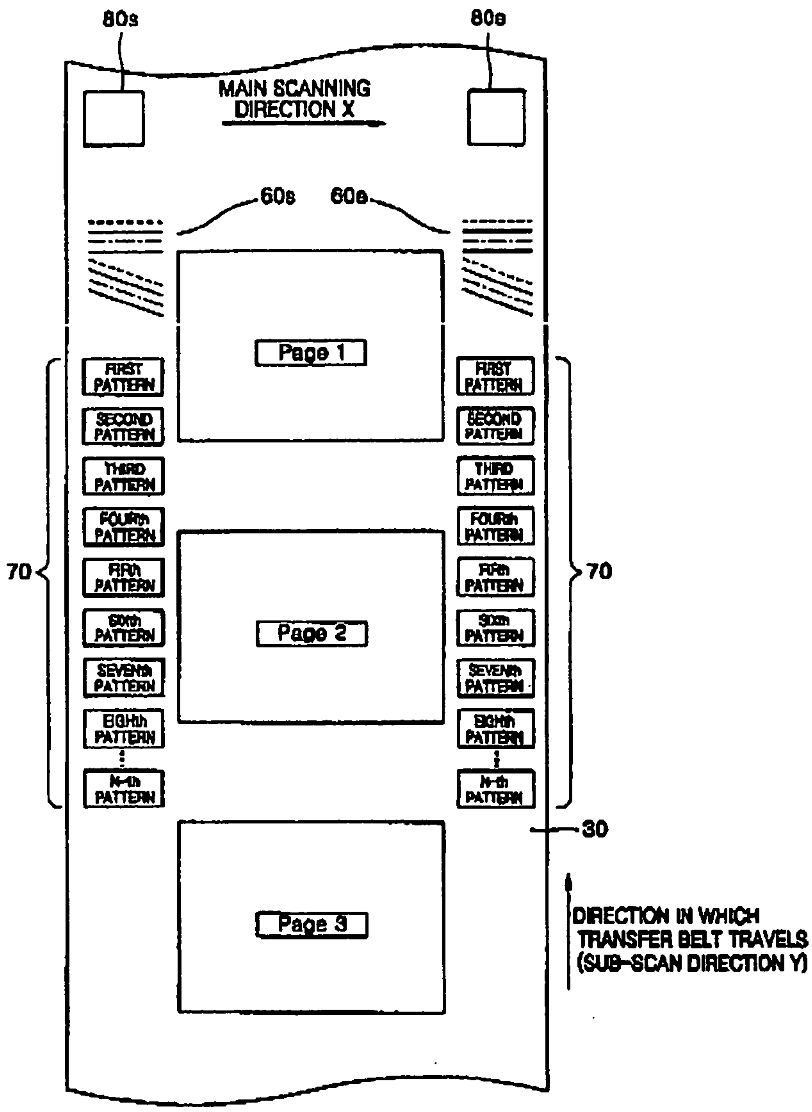
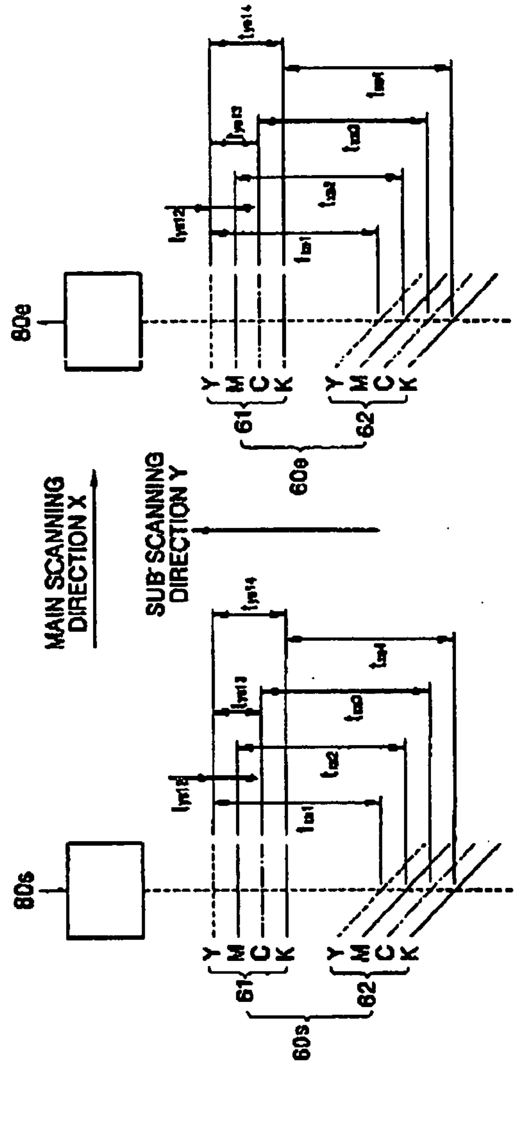

80s
80e
MAIN SCANNING DIRECTION X
60s
60e
Page 1
Page 2
Page 3
FIRST PATTERN
SECOND PATTERN
THIRD PATTERN
FOURth PATTERN
FIFth PATTERN
SIXth PATTERN
SEVENth PATTERN
EIGHth PATTERN
N-th PATTERN
70
30
DIRECTION IN WHICH TRANSFER BELT TRAVELS (SUB-SCAN DIRECTION Y)

FIG. 5


MAIN SCANNING DIRECTION X
SUB-SCANNING DIRECTION Y
80s
80e
Y
M
C
K
61
62
60s
60e

REFERENCES CITED IN THE DESCRIPTION

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- EP 1394625 A **[0010]**
- US 6185386 A **[0011]**
- EP 1253482 A **[0012]**