Description

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a beam recorder which records an image on a record medium by a beam.

Related Background Art

In a conventional laser beam printer of this type, a rotating polygon mirror for scanning a laser beam is constructed such that all planes thereof scan the beam for forming an image. Accordingly, for each of the planes of the rotating polygon mirror, it is necessary to attain high precision in planarity and parallelism of the planes. However, in practice, since it is not possible to completely eliminate a difference between parallelisms of the planes, an optical system for compensating resulting ununiformity in the scan in a sub-scan direction (a correcting cylindrical lens) is required. As a result, the apparatus is complex and expensive in view of part precision, number of parts, and assembly work of the parts. In a low speed and low grade apparatus, the number of planes of the rotating polygon mirror is reduced as much as possible to reduce a cost. Nevertheless, the complex and expensive construction has not yet been resolved.

In the conventional laser beam printer of this type, various restrictions are imposed when an intensity of the laser beam is to be controlled. A semiconductor laser is usually used as a laser light source for the laser beam printer of this type. The semiconductor laser has a disadvantage of variation of intensity with a temperature and reduction of intensity by deterioration. As a result, an intensity control system is adopted in which an output of a photo-sensor mounted in the semiconductor laser is detected to keep the laser light intensity constant.

Fig. 4 shows a laser light intensity control circuit. A microprocessor (MPU) 21 produces a laser on (LON) signal to turn on a transistor 27 and supplies a digital value to a D/A converter 22 to gradually increase the output of the D/A converter 22. As a result, a current I_{OP} flowing through a laser diode 29 of a laser unit 28 gradually increases by a constant current circuit (CC) 24 so that a light intensity of the laser diode 29 increases. A laser beam from the laser diode 29 is emitted externally and also to an internal photo-diode 30. As a result, a photo-diode current I_M which is proportional to the light intensity emitted externally flows. It is converted to a voltage V_M by a resistor 31 and supplied to an amplifier (AMP) 25. The output of the amplifier 25 is supplied to an A/D converter 23 where it is converted to a digital signal, which is read by a microprocessor 21. The microprocessor 21 increases the output of the D/A converter 22 until the output read by the microprocessor 21 reaches a predetermined value, when the output of the D/A converter 22 is fixed. The digital value currently applied to the D/A converter 22 is stored and the signal LON is turned off. In this manner, the laser light intensity is controlled.

In a print mode, the microprocessor 21 applies the stored digital value to the D/A converter 22. A video (VDO) signal turns on and off a transistor 27 so that the laser diode 29 is turned on and off by a constant current pulse.

In the laser light intensity control system described above, it is necessary to continuously emit the laser beam when the light intensity of the laser is detected. Where the conventional rotating polygon mirror is used, the emitted laser beam is necessarily directed to a photosensitive member. Accordingly, if toner deposits to the photo-sensitive member, the toner is wasted. Accordingly, it is necessary to control the process such that the toner is not developed. In a one-sheet print operation, the process may be controlled prior to the actual print operation such that the toner is not developed and then the light intensity of the laser may be detected. In continuous print operation, because of the change of laser intensity by temperature, it is necessary to detect the laser light intensity between n-th printing and (n+1)th printing. Accordingly, in order to control the process such that the toner is not developed during that period, a complex process control is required, and fast response of the development process is required.

In the conventional laser beam printer of this type, the photo-sensitive member is deteriorated by the wasteful laser beam irradiation to the photosensitive member.

In order to attain stable light intensity and provide an inexpensive recorder, the assignee of the present invention proposed the apparatus disclosed in U.S.P. 4,201,994, U.S.P. 4,443,695, U.S.P. 4,695,714, and U.S. Serial No. 149,526 (filed on Jan. 28, 1988). However, further improvement has been desired.

SUMMARY OF THE INVENTION

According to the present invention there is provided a beam recorder as set out in claim 1. The remaining claims set out optional features.

Embodiments of the present invention may provide an inexpensive beam recorder.

Embodiments of the present invention may provide a long-life or durable beam recorder.

Embodiments of the present invention may provide a beam recorder of a simple construction which attains a stable light intensity.

Embodiments of the present invention may provide a recorder which prevents degradation of a record medium.

Embodiments of the present invention may provide a beam recorder which prevents complex construction or complex program.

Embodiments of the present invention may provide an image recorder which eliminates restriction on sequence control when the laser light beam is controlled, saves degradation factor and waste for process elements such as photo-sensitive member and developing unit, and improves performance such as fine control of the laser light beam so that higher quality of image is attained.

Embodiments of the present invention, given by way of non-limiting example, will now be described with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1A - 1C show a schematic view of one embodiment of a laser beam printer of the present invention and timing charts of laser light intensity control which uses a polygon mirror of the embodiment.

Fig. 2 shows an internal construction of the laser beam printer of the embodiment.

Fig. 3 shows laser beam scan by a polygon mirror of the embodiment and a BD signal detection method.

Fig. 4 shows a circuit diagram of laser light intensity control of the embodiment.

Figs. 5A - 5C show a conventional polygon mirror and the polygon mirror of the embodiment.

Figs. 6A - 6C show a BD signal in the conventional method and a BD signal in the embodiment, and a period of laser light intensity control.

Figs. 7A and 7B show a circuit diagram for detecting the laser light beam control period of the embodiment and a time chart of the operation.

Fig. 8 shows a sequence of laser light intensity control of the embodiment and signal levels in the circuit.

Figs. 9A, 9B, 10A and 10B show polygon mirrors in other embodiments.

Fig. 11 shows a time chart for the laser light intensity control in a print mode, and

Fig. 12 shows another time chart for the laser light intensity control in the print mode.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A recorder of one embodiment of the present invention is an electrostatic recording type image recorder having an optical system for forming and scanning an image by a rotating polygon mirror and a laser beam emitted from a laser light source at least one of reflection planes of the rotating polygon mirror is a non-scan plane which does not form or scan the image and a laser light intensity is controlled while the laser beam is directed to the non-scan plane.

The present embodiment is now explained with reference to the drawings.

Fig. 2 shows a construction of the laser beam printer of the present embodiment. After power-on, a printer 1 checkes if a temperature of a fixing unit 12 is proper, if sheets 13 are in a sheet cassette 14 and other internal status, and inform to an external host controller (not shown) whether a print operation is ready or not. When the print operation is ready, the host controller sends a start of print command to the printer 1 as required so that the printer 1 starts the print operation. In the laser beam printer of the present embodiment, in order to initialize a surface potential of a photo-sensitive drum 2, a pre-exposure lamp 8, a primary charger 3 and a transfer unit 6 are activated and a polygon mirror 4 is rotated. As the photo-sensitive drum 2 is initialized and the rotation of the polygon mirror 4 is stabilized, a sheet 13 is fed from a sheet cassette 14 by a feed roller 9. When a leading edge of the sheet reaches a registration roller 10 and forms a loop, the feed of the sheet by the feed roller 9 is stopped and it stands by. The printer 1 then requests to the host controller to send a sub-scan direction synchronization signal (VSYNC signal). In response thereto, the host controller sends the VSYNC signal and sends an image signal (VDO signal) in synchronism with a main scan direction synchronization signal (BD signal) from the printer 1.

Figs. 1A and 3 show laser beam scan by the polygon mirror and a method for detecting a BD signal. A laser beam emitted from the laser 18 is scanned by the polygon mirror 4 to form a light image on the photo-sensivive drum 2 in the main scan direction (arrow). The laser beam is directed to the photo-sensor 20 by the mirror 19 so that a synchronization signal (BD signal) indicating the beam scan position is produced. The mirror 19 is arranged outside of an area in which the laser beam form the light image on the photo-sensitive drum 2. The photo-sensor 20 is arranged at an equal distance to that from the polygon mirror 4 to the photo-sensitive drum 2. The laser beam reflected by the polygon mirror 4 is focused onto the

photo-sensitive drum 2 by the fθ lens 17 and the mirror 16 of Fig. 2 to form the light image. The light image is then developed by the developing unit 5 into a toner image. The leading edge registration of the toner image and the sheet is effected by rotating the registration roller 10 in synchronism with the VSYNC signal. The toner image is transferred to the registered sheet by the transfer unit 6, and the sheet is fed to the fixing unit 12 by the feeder 11 where the toner image is fixed to the sheet. The sheet is then fed to the eject tray 15. The toner image which was not transferred to the sheet by the transfer unit 6 is scraped off the photo-sensitive drum 2 by the cleaner 7.

In a one-sheet print mode, the laser 18 is deactivated at the end of formation of the light image on the photo-sensitive drum 2 and the rotation of the polygon mirror 4 is stopped. At the end of transfer of the toner image to the sheet by the toner unit 6, the photo-sensitive drum 2 is initialized, and after the sheet has been ejected, the rotation of the photo-sensitive drum 2 is stopped to terminate the print operation. In a continuous print mode, after the image signal has been sent for the sheet on which the print operation is being effected, a start of print command for the next sheet is requested to the host controller. In response to the start of print command, the sheet 13 is fed from the sheet cassette 14 so that the print operation is continued.

Figs. 5A and 5B show conventional polygon mirror, and Fig. 5C shows the polygon mirror of the embodiment. Fig. 1A also shows the polygon mirror 4 which is similar to that shown in Fig. 5C. As shown in Figs. 5A and 5B, the conventional polygon mirrors have six or eight reflection planes, all of which are micro-finished to reflect the laser beam at a high reflection factor. On the other hand, the polygon mirror of the embodiment has four planes as shown in Fig. 5C, and the planes A and C are not mirror-finished and are blank-coated (non-reflection coating) to reduce the reflection of laser beam as much as possible. Accordingly, it is the planes B and D that scan the beam for forming the image. As a result, the number of planes is 1/3 to 1/4 of that of the conventional polygon mirror and hence the polygon mirror of the embodiment must be rotated at a speed which is as 3 - 4 times high level that of the conventional polygon mirror. However, in the laser beam printer of the embodiment, the print speed is 1/2 - 1/3 of that of the conventional printer. Accordingly, the rotation speed of the polygon mirror may be as 1 - 2 times high as that of the conventional mirror and this does not cause a practical problem. In the laser beam printer of the embodiment, an image exposure system is used so that the toner is developed only at the area on the photo-sensitive drum to which the laser beam was irradiated. Accordingly, the planes A and C are black-coated in order to minimize the reflection of the laser beam.

Fig. 6A shows the BD signal produced when the planes A and C of the polygon mirror of Fig. 5C are not non-reflection planes. The BD signal produced by the polygon mirror of the embodiment shown in Figs. 1B and 6B, which has non-reflection planes A and C does not appear in periods τ_A and τ_C. The image is scanned on the photo-sensitive drum in periods T_B and T_D, as shown in Fig. 1C and 6C. Since the planes A and C are non-reflection planes, the photo-sensitive drum is not affected even if the laser is left activated at least during the periods τ_A and τ_C. Accordingly, the laser beam intensity may be controlled during the periods τ_A and τ_C. Thus, the waste of the toner by the prior art laser light intensity control, the complexity of process control to prevent the waste of the toner, and the degradation of the photo-sensitive member are prevented.

A method for detecting the laser light intensity control period is explained. In the present embodiment, the laser light intensity is controlled in the periods τ_A and τ_C of Fig. 6C. Since the laser beam is not reflected by the planes A and C, the BD signal cannot be directly obtained. Accordingly, it is necessary to separately produce a signal indicating the periods τ_A and τ_C or the starts of those periods.

Fig. 7A shows a circuit diagram to produce the signal indicating the periods τ_A and τ_C, and Fig. 7B shows an operational timing chart. A microprocessor 21 sets a count to a counter 32. The microprocessor 21 control the light intensity as shown in Fig. 4 and controls the sequential operation of the printer. The count may be set to the counter 32 by other circuit than the microprocessor 21. The counter 32 is reset by the BD signal and then counts the above count by a clock signal CLK. The clock signal CLK may be one which is in synchronism with a record clock used to transfer the image signal. The count is selected such that an RC signal is produced after T_1 time as shown in Fig. 7B. In the present embodiment, $T_1 \geq \tau_A$ (or $T_1 \geq \tau_A = \tau_B = \tau_C = \tau_D$). The counter 32 counts up to produce the RC signal, and a latch 33 latches it to produce an H level Q-output, which is cleared by the next BD signal to assume an L-level. Accordingly, the period T_2 in which the Q-output of the latch 33 is H-level is no shorter than τ_A ($T_2 \leq \tau_A$, or $T_2 \leq \tau_A = \tau_B = \tau_C = \tau_D$), and the microprocessor 21 controls the laser light intensity in the period of the H-level Q-output.

Fig. 8 shows a timing chart for a sequence of laser light intensity control of the embodiment. The circuit shown in Fig. 4 is used as the laser light intensity control circuit, although other circuit may

be used. The microprocessor 21 renders a LON signal to H-level to turn on a transistor 27, and supplies a digital value to a D/A converter 22, which produces a signal D/A as shown in Fig. 8. As a result, the output of the D/A converter 22 is gradually increased. Accordingly, a current I_{OP} flowing through a laser diode 29 of a laser unit 28 gradually increases as shown in Fig. 8 by a constant current circuit 24 so that the light intensity of the laser diode 29 increases. The output beam of the laser diode 29 is also directed to a photo-diode 30 in the laser unit 28 and a photo-current I_M which is proportioanl to the externally emitted laser beam intensity flows, and it is converted to a voltage V_M by a resistor 31 and it is supplied to an amplifier 25. The output of the amplifier 25 is supplied to an A/D converter 23 where it is converted to a digital signal, which is read by the microprocessor 21. The micro-processor 21 increases the output of the D/A converter 22 until the digital signal reaches a predetermined value ($V_M = V_{MS}$), when it stops to increase the output. The microprocessor 21 stores the digital value applied to the D/A converter 22 when V_M reaches V_{MS}, and renders the LON signal to L-level and renders the output of the D/A converter 22 to zero to terminate the laser light intensity control.

In the print mode, the microprocessor 21 renders the LON signal to the L-level and supplies to the D/A converter 22 the stored digital value for the predetermined light intensity. Under this condition, the VDO signal is driven by the constant current pulse. The laser light intensity control, that is, the detection of the level of the signal V_{MS} of Fig. 8 is effected in the periods τ_A and τ_C of Fig. 6C. However, when the apparatus is powered on, the microprocessor 21 does not have the digital value to be supplied to the D/A converter 22 to produce the signal V_{MS}, because the laser current I_{OPS} necessary to produce the predetermined light intensity differs from laser unit 28 to laser unit 28. Accordingly, before the image scan for the first print operation after the power-on, the microprocessor 21 must detect the V_{MS} level. In order to detect the V_{MS} level, the laser current I_{OP} is supplied to some extent so that the laser diode 29 emits light. Otherwise, the output of the photo-sensor 20 for detecting the BD signal cannot be produced and the periods τ_A and τ_C of Figs. 6B and 6C cannot be detected. Thus, when the V_{MS} level is to be detected in the first laser light intensity control after the power-on, the laser current which is large enough to produce the BD signal may be supplied instead of gradually increasing the laser current I_{OP} from zero. However, as described above, a relation between the laser current of the laser unit 28 and the light intensity differs from unit to unit, and in a conventional semiconductor laser, the laser device may be deteriorated or broken if it is operated over a specified maximum light intensity. For example, a laser A may emit a light below a maximum light intensity Pmax with the laser current I_{OP1} but a laser B may emit a light above the maximum light intensity Pmax with the laser current I_{OP1}. A laser C may emit a light which is too weak to produce the BD signal with the laser current I_{OP1}. Accordingly, it is difficult to determine the initial value of the laser current I_{OP} in the first laser light beam control, and the initial value may be set. to zero or I_{OP} min which assures that the light intensity does not exceed the maximum light intensity for all lasers to be used. When those methods are used, the BD signal is not produced until the predetermined light intensity is reached in the laser light intensity control. In the present embodiment, the first laser light intensity control after the power-on is effected after the start of the print operation and the start of the rotation of the polygon mirror 4, and the initial laser current I_{OP} is set to zero. Accordingly, until the first BD signal is produced as the laser current I_{OP} increases, the laser beam is directed to all planes A, B, C and D of the polygon mirror of Fig. 5C. Thus, in the periods in which the laser beam is directed to the planes B and D, the laser beam is irradiated to the photo-sensitive drum 2. In the present embodiment, the process condition is controlled such that the toner is not developed in spite of the irradiation of the laser beam to the photo-sensitive drum 2 until the BD signal has a normal period as the laser current I_{OP} is increased, that is, until the polygon mirror 4 is rotated at a normal rotation speed. In order to implement it, all outputs of the primary charger 3, the developing unit 5 and the transfer unit are turned off. Where the photo-sensitive drum 2 is initialized at the start of the rotation of the polygon mirror 4 and the laser light intensity control after the start of print operation in order to save wasteful time, only the primary charger 3 may be turned on. In this manner, the first laser light intensity control after the power-on is effected. If the detection of the predetermined laser light intensity is completed before the BD signal having the normal period is produced, the laser is activated at the predetermined light intensity until the BD signal of the normal period is produced. If the predetermined laser light intensity is not attained when the BD signal having the normal period is produced, the laser light intensity control is continued in the periods τ_A and τ_C of Figs. 6B and 6C. In any case, when the laser light intensity control is completed and the BD signal having the normal period is produced, the laser is activated at the predetermined light intensity only at the timing to produce the BD signal until the actual print operation is started.

As described above, the laser light intensity control in the print mode is effected in the periods τ_A and τ_C of Figs. 6B and 6C. The laser light intensity control may be effected between the n-th printing and the (n + 1)th printing, that is, during the absence of the image scan, as well as during the image scan by utilizing the periods τ_A and τ_C of Figs. 6B and 6C. In this manner, the image quality is improved by compensating for the variation of the laser light intensity for each line scan. The digital value to be supplied to the D/A converter 22 to supply the predetermined laser current I_{OPS} in the first laser light intensity control after the power-on may be stored in a RAM of the microprocessor 21. Thus, in the subsequent laser light intensity control, the laser light intensity control may start from $I_{OP} = I_{OPS}$ or $I_{OP} = I_{OPS} - \alpha$ instead of $I_{OP} = 0$ so that the light intensity control is finished in a shorter time. This is illustrated in Fig. 11. The start laser current I_{OPn} at the n-th laser light intensity control may be $I_{OPS}(n-1)$ or $I_{OPS}(n-1) - \alpha$, where $I_{OPS}(n-1)$ is the laser current produced in the (n-1)th control. This is illustrated in Fig. 12.

Fig. 9A shows a polygon mirror in another embodiment. In the present embodiment, the planes A and C are round so that the laser beams directed to the planes A and C are reflected to areas other than the photo-sensitive drum and the BD sensor.

Fig. 9B shows a polygon mirror in another embodiment. In the present embodiment, the planes A and C are inclined relative to the planes B and D so that the laser beam is not reflected to the photo-sensitive drum or the BD sensor.

Figs. 10A and 10B show polygon mirrors having more than four planes. In the present embodiment, the reflection plane and the non-reflection plane alternatively appear.

In the above embodiments, the laser light intensity control may be effected in either scan period or non-scan period of the image, or it may be continuously effected to improve the lifetimes of the apparatus and laser. Alternatively, it may be effected at any time such as periodically, at every predetermined number of printed sheets, or when a change in a temperature in a vicinity of the laser is detected.

In the above embodiment, the laser light intensity control is effected by continuously activating the laser until the BD signal has the normal period at the start of rotation of the polygon mirror. Alternatively, if the BD signal is produced and the periods τ_A and τ_C are longer than the period required to control the laser light intensity even if $\tau_B > \tau_D$ (or $\tau_C > \tau_A$), the laser light intensity control in the periods τ_A and τ_C may be started at this moment.

A circuit for generating a signal for assuring the periods τ_A and τ_C to be one half of the BD period may be provided to control the laser light intensity in the signal period.

The present invention is not limited to the above embodiments but various modifications thereof may be made.

Claims

1. A beam recorder in which a beam is deflected along a recording path by a face (B,D) of a deflection means (4) to effect a recording operation, and a control means (21) performs a beam intensity control operation to control the intensity of the beam,
   characterised in that
   the deflection means (4) has at least one portion (A,C) which is struck by the beam and does not deflect the beam along the recording path, and the control means (21) performs the beam intensity control operation using a period in which the beam strikes a said portion (A,C).

2. A beam recorder according to claim 1 in which the said portion (A,C) of the deflection means (4) is a curved portion.

3. A beam recorder according to claim 1 in which the said portion (A,C) of the deflection means (4) is a plane portion which is inclined relative to said face (B,D) to deflect the beam along a path other than the recording path.

4. A beam recorder according to claim 1 in which the said portion (A,C) of the deflection means (4) is non-reflective.

5. A beam recorder according to any one of the preceding claims in which the deflection means (4) comprises a plurality of faces (B,D) which deflect the beam along the recording path and a plurality of said portions (A,C) which do not deflect the beam along the recording path.

6. A beam recorder according to claim 5 in which the deflection means (4) is a rotating polygon mirror.

7. A beam recorder according to claim 6 in which control means (21) performs the beam intensity control operation during the period in which the beam is directed to the said face (B,D) of the rotating polygon mirror (4) until the rotating polygon mirror reaches a predetermined rotation speed.

As described above, the laser light intensity control in the print mode is effected in the periods τ_A and τ_C of Figs. 6B and 6C. The laser light intensity control may be effected between the n-th printing and the (n+1)th printing, that is, during the absence of the image scan, as well as during the image scan by utilizing the periods τ_A and τ_C of Figs. 6B and 6C. In this manner, the image quality is improved by compensating for the variation of the laser light intensity for each line scan. The digital value to be supplied to the D/A converter 22 to supply the predetermined laser current I_{OPS} in the first laser light intensity control after the power-on may be stored in a RAM of the microprocessor 21. Thus, in the subsequent laser light intensity control, the laser light intensity control may start from $I_{OP} = I_{OPS}$ or $I_{OP} = I_{OPS} - \alpha$ instead of $I_{OP} = 0$ so that the light intensity control is finished in a shorter time. This is illustrated in Fig. 11. The start laser current I_{OPn} at the n-th laser light intensity control may be $I_{OPS}(n-1)$ or $I_{OPS}(n-1) - \alpha$, where $I_{OPS}(n-1)$ is the laser current produced in the (n-1)th control. This is illustrated in Fig. 12.

Fig. 9A shows a polygon mirror in another embodiment. In the present embodiment, the planes A and C are round so that the laser beams directed to the planes A and C are reflected to areas other than the photo-sensitive drum and the BD sensor.

Fig. 9B shows a polygon mirror in another embodiment. In the present embodiment, the planes A and C are inclined relative to the planes B and D so that the laser beam is not reflected to the photo-sensitive drum or the BD sensor.

Figs. 10A and 10B show polygon mirrors having more than four planes. In the present embodiment, the reflection plane and the non-reflection plane alternatively appear.

In the above embodiments, the laser light intensity control may be effected in either scan period or non-scan period of the image, or it may be continuously effected to improve the lifetimes of the apparatus and laser. Alternatively, it may be effected at any time such as periodically, at every predetermined number of printed sheets, or when a change in a temperature in a vicinity of the laser is detected.

In the above embodiment, the laser light intensity control is effected by continuously activating the laser until the BD signal has the normal period at the start of rotation of the polygon mirror. Alternatively, if the BD signal is produced and the periods τ_A and τ_C are longer than the period required to control the laser light intensity even if $\tau_B > \tau_D$ (or $\tau_C > \tau_A$), the laser light intensity control in the periods τ_A and τ_C may be started at this moment.

A circuit for generating a signal for assuring the periods τ_A and τ_C to be one half of the BD period may be provided to control the laser light intensity in the signal period.

The present invention is not limited to the above embodiments but various modifications thereof may be made.

Claims

1. A beam recorder in which a beam is deflected along a recording path by a face (B,D) of a deflection means (4) to effect a recording operation, and a control means (21) performs a beam intensity control operation to control the intensity of the beam,
   characterised in that
   the deflection means (4) has at least one portion (A,C) which is struck by the beam and does not deflect the beam along the recording path, and the control means (21) performs the beam intensity control operation using a period in which the beam strikes a said portion (A,C).

2. A beam recorder according to claim 1 in which the said portion (A,C) of the deflection means (4) is a curved portion.

3. A beam recorder according to claim 1 in which the said portion (A,C) of the deflection means (4) is a plane portion which is inclined relative to said face (B,D) to deflect the beam along a path other than the recording path.

4. A beam recorder according to claim 1 in which the said portion (A,C) of the deflection means (4) is non-reflective.

5. A beam recorder according to any one of the preceding claims in which the deflection means (4) comprises a plurality of faces (B,D) which deflect the beam along the recording path and a plurality of said portions (A,C) which do not deflect the beam along the recording path.

6. A beam recorder according to claim 5 in which the deflection means (4) is a rotating polygon mirror.

7. A beam recorder according to claim 6 in which control means (21) performs the beam intensity control operation during the period in which the beam is directed to the said face (B,D) of the rotating polygon mirror (4) until the rotating polygon mirror reaches a predetermined rotation speed.

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8. A beam recorder according to claim 7, further comprising:

a photo-sensitive member (2) scanned by the beam deflected by said rotating polygon mirror (4); and

means (5) for visualizing the image formed on the photo-sensitive member (2) by toner,

and wherein the beam recorder is controlled such that the toner is not deposited to the photo-sensitive member (2) until the rotating polygon mirror (4) reaches the predetermined rotation speed.

9. A beam recorder according to any one of claims 6 to 8 in which the control means (21) includes storage means for storing a beam intensity control value, and the beam intensity control operation is carried out using the beam intensity control value stored in the storage means after the rotating polygon mirror (4) has reached the predetermined rotation speed.

10. A beam recorder according to any one of the preceding claims which comprises detector means (20) to detect the beam on occasions in which it has been deflected along the recording path, and following start-up of the beam recorder the control means (21) performs the beam intensity control operation regardless of whether the beam is deflected along the recording path during a period before the beam reaches an intensity which is detectable by the detector means (20).

11. A beam recorder according to any one of the preceding claims in which the control means (21) determines a period when the beam is directed to a said portion (A,C) of the deflection means (4) from a synchronisation signal generated when the beam is directed to a face (B,D) of the deflection means (4) which deflects the beam along the recording path.

Patentansprüche

1. Strahlaufzeichnungsgerät, bei dem ein Strahl mittels einer Fläche (B, D) einer Ablenkvorrichtung (4) entlang eines Aufzeichnungsweges zum Herbeiführen eines Aufzeichnungsvorganges abgelenkt wird und eine Steuervorrichtung (21) zur Steuerung der Intensität des Strahls eine Strahlintensitätssteuerung durchführt,
dadurch gekennzeichnet, daß
die Ablenkvorrichtung (4) mindestens einen Abschnitt (A, C) aufweist, der von dem Strahl getroffen wird und den Strahl nicht entlang des Aufzeichnungsweges ablenkt, und die Steuervorrichtung (21) die Strahlintensitätssteuerung in einem Zeitraum durchführt, in dem der Strahl einen solchen Abschnitt (A, C) trifft.

2. Strahlaufzeichnungsgerät nach Anspruch 1, bei dem der Abschnitt (A, C) der Ablenkvorrichtung (4) gekrümmt ist.

3. Strahlaufzeichnungsgerät nach Anspruch 1, bei dem der Abschnitt (A, C) der Ablenkvorrichtung (4) ein ebener Abschnitt ist, der gegenüber der Fläche (B, D) geneigt ist, um den Strahl entlang einem anderen Weg als dem Aufzeichnungsweg abzulenken.

4. Strahlaufzeichnungsgerät nach Anspruch 1, bei dem der Abschnitt (A, C) der Ablenkvorrichtung (4) nicht reflektierend ist.

5. Strahlaufzeichnungsgerät nach einem der vorangehenden Ansprüche, bei dem die Ablenkvorrichtung (4) eine Vielzahl von Flächen (B, D), die den Strahl entlang des Aufzeichnungsweges ablenken, und eine Vielzahl von den Abschnitten (A, C) aufweist, die den Strahl nicht entlang des Aufzeichnungsweges ablenken.

6. Strahlaufzeichnungsgerät nach Anspruch 5, bei dem die Ablenkvorrichtung (4) ein rotierender Polygonalspiegel ist.

7. Strahlaufzeichnungsgerät nach Anspruch 6, bei dem die Steuervorrichtung (21), die Strahlintensitätssteuerung während des Zeitraums durchführt, in dem der Strahl auf die Fläche (B, D) des rotierenden Polygonalspiegels (4) gerichtet ist, bis der rotierende Polygonalspiegel eine vorbestimmte Rotationsgeschwindigkeit erreicht.

8. Strahlaufzeichnungsgerät nach Anspruch 7, das darüberhinaus
ein lichtempfindliches Bauteil (2), das von dem mittels des rotierenden Polygonalspiegels (4) abgelenkten Strahl abgetastet wird; und
eine Vorrichtung (5) zum Sichtbarmachen des auf dem lichtempfindlichen Bauteil (2) entstandenen Bildes mittels Toner enthält,
und bei dem das Strahlaufzeichnungsgerät so gesteuert wird, daß der Toner nicht auf dem lichtempfindlichen Bauteil (2) abgeschieden wird, bis der rotierende Polygonalspiegel (4) die vorbestimmte Rotationsgeschwindigkeit erreicht.

9. Strahlaufzeichnungsgerät nach einem der Ansprüche 6 bis 8, bei dem die Steuervorrichtung (21) eine Speichereinrichtung zum Speichern

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eines Strahlintensitätssteuerungswertes enthält und die Strahlintensitätssteuerung unter Verwendung des in der Speichereinrichtung gespeicherten Strahlintensitätssteuerungswertes ausgeführt wird, nachdem der rotierende Polygonalspiegel (4) die vorbestimmte Rotationsgeschwindigkeit erreicht hat.

10. Strahlaufzeichnungsgerät nach einem der vorangehenden Ansprüche, das eine Detektorvorrichtung (20) enthält, die den Strahl erfaßt, wenn er entlang des Aufzeichnungswegs abgelenkt worden ist, und bei dem die Steuervorrichtung (21) nach der Anlaufphase des Strahlaufzeichnungsgerätes die Strahlintensitätssteuerung während eines Zeitraums, bevor der Strahl eine durch die Detektoreinrichtung (20) nachweisbare Intensität erreicht, unabhängig davon durchführt, ob der Strahl entlang des Aufzeichnungsweges abgelenkt wird.

11. Strahlaufzeichnungsgerät nach einem der vorangehenden Ansprüche, bei dem die Steuervorrichtung (21) einen Zeitraum, in dem der Strahl auf einen der Abschnitte (A, C) der Ablenkvorrichtung (4) gerichtet ist, an Hand eines Synchronisationssignals bestimmt, das erzeugt wird, wenn der Strahl auf eine den Strahl entlang des Aufzeichnungsweges ablenkende Fläche (B, C) der Ablenkvorrichtung (4) gerichtet ist.

Revendications

1. Enregistreur à faisceau dans lequel un faisceau est dévié le long d'un trajet d'enregistrement par une face (B,D) d'un moyen de déviation (4) pour effectuer une opération d'enregistrement, et un moyen de commande (21) exécute une opération de commande d'intensité du faisceau pour commander l'intensité du faisceau,

caractérisé en ce que

le moyen de déviation (4) comporte au moins une partie (A,C) qui est atteinte par le faisceau et qui ne dévie pas le faisceau le long du trajet d'enregistrement, et le moyen de commande (21) exécute l'opération de commande d'intensité du faisceau en utilisant une période pendant laquelle le faisceau frappe ladite partie (A,C).

2. Enregistreur à faisceau selon la revendication 1, dans lequel ladite partie (A,C) du moyen de déviation (4) est une partie courbe.

3. Enregistreur à faisceau selon la revendication 1, dans lequel ladite partie (A,C) du moyen de déviation (4) est une partie plane qui est inclinée par rapport à ladite face (B,D) afin de dévier le faisceau le long d'un trajet autre que le trajet d'enregistrement.

4. Enregistreur à faisceau selon la revendication 1, dans lequel ladite partie (A,C) du moyen de déviation (4) est non réfléchissante.

5. Enregistreur à faisceau selon l'une quelconque des revendications précédentes, dans lequel le moyen de déviation (4) comprend plusieurs faces (B,D) qui dévient le faisceau le long du trajet d'enregistrement et plusieurs desdites parties (A,C) qui ne dévient pas le faisceau le long du trajet d'enregistrement.

6. Enregistreur à faisceau selon la revendication 5, dans lequel le moyen de déviation (4) est un miroir polygonal tournant.

7. Enregistreur à faisceau selon la revendication 6, dans lequel le moyen de commande (21) exécute l'opération de commande d'intensité du faisceau durant la période au cours de laquelle le faisceau est dirigé sur ladite face (B,D) du miroir polygonal tournant (4) jusqu'à ce que le miroir polygonal tournant atteigne une vitesse de rotation prédéterminée.

8. Enregistreur à faisceau selon la revendication 7, comportant en outre :

un élément photosensible (2) balayé par le faisceau dévié par ledit miroir polygonal tournant (4) ; et

un moyen (5) destiné à visualiser l'image formée sur l'élément photosensible (2) à l'aide d'un toner,

et dans lequel l'enregistreur à faisceau est commandé de manière que le toner ne soit pas déposé sur l'élément photosensible (2) avant que le miroir polygonal tournant (4) ait atteint la vitesse prédéterminée de rotation.

9. Enregistreur à faisceau selon l'une quelconque des revendications 6 à 8, dans lequel le moyen de commande (21) comprend un moyen de mémorisation destiné à mémoriser une valeur de commande d'intensité du faisceau, et l'opération de commande d'intensité du faisceau est exécutée en utilisant la valeur de commande d'intensité de faisceau mémorisée dans le moyen de mémorisation après que le miroir polygonal tournant (4) a atteint la vitesse prédéterminée de rotation.

10. Enregistreur à faisceau selon l'une quelconque des revendications précédentes, qui comporte

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un moyen détecteur (20) destiné à détecter le faisceau lors d'occasions où il a été dévié le long du trajet d'enregistrement et, à la suite de la mise en marche de l'enregistreur à faisceau, le moyen de commande (21) exécute l'opération de commande d'intensité du faisceau indifféremment au fait que le faisceau ait été dévié le long du trajet d'enregistrement durant une période avant que le faisceau atteigne une intensité pouvant être détectée par le moyen détecteur (20).

11. Enregistreur à faisceau selon l'une quelconque des revendications précédentes, dans lequel le moyen de commande (21) détermine une période pendant laquelle le faisceau est dirigé sur ladite partie (A,C) du moyen de détection (4) à partir d'un signal de synchronisation généré lorsque le faisceau est dirigé sur une face (B,D) du moyen de déviation (4) qui dévie le faisceau le long du trajet d'enregistrement.