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(54) Method and apparatus for exposing an image recording medium

Verfahren und Vorrichtung zur Belichtung eines Bildaufzeichnungsmediums

Procédé et appareil pour exposer un support d'enregistrement d'image

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- **PATENT ABSTRACTS OF JAPAN vol. 018, no. 577 (E-1625), 4 November 1994 & JP 06 216452 A (SUMITOMO CEMENT CO LTD), 5 August 1994,**
- **PATENT ABSTRACTS OF JAPAN vol. 018, no. 464 (E-1598), 29 August 1994 & JP 06 152034 A (SUMITOMO CEMENT CO LTD), 31 May 1994,**
- **PATENT ABSTRACTS OF JAPAN vol. 016, no. 551 (P-1453) 20 November 1992 & JP 04 208 916 A (DAINIPPON SCREEN MFG CO LTD) 30 July 1992**

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Description

[0001] The present invention relates to a method and apparatus for exposing an image recording medium, such as a thermal printing plate.

[0002] Figure 1 is a side view of a conventional single beam internal drum imagesetter. A laser 1 generates a laser beam 2 which is directed onto an angled reflective surface 3 of a spinning mirror 4. The spinning mirror 4 is rotated by a motor 5 which is mounted on a carriage (not shown). The carriage (not shown) is driven parallel to the axis of a drum 7 by rotation of a lead screw 6. Items 3-6 are housed inside the drum 7. One or more image recording plates (not shown) are mounted on the inner surface of the drum 7. To expose the image recording plates on the drum 7, the motor 3 moves along the axis of the drum 7, and rotates the spinning mirror 4 about the axis of the drum 7 whereby the reflected laser beam 8 exposes a series of circumferential scan lines.

[0003] As can be seen in Figure 2, which is an end view of the apparatus shown in Figure 1, during the lower 80° of its revolution, the reflected laser beam 8 is blocked by the carriage 136. This creates a shadow area 9 which prevents the scanner from exposing a full 360° of the drum 7 and reduces the speed and efficiency of the system. The angle of the area outside the shadow area 9 is conventionally known as the "drum angle".

[0004] A known way of improving on the efficiency and scanning time of the system of Figure 1 is to add a second spinner and a second laser as illustrated in Figure 3.

[0005] Figure 3 illustrates the lower half 10 of a cylindrical drum. A first mirror 11 and a second mirror 12 are mounted at 180° to each other on a common shaft 13 which is rotated by a motor (not shown). A first laser 14 is directed at the spinning mirror 11, and a second laser 15 is directed at the spinning mirror 12. The distance between the reflective surfaces of the spinning mirrors 11,12 is equal to half the length of the drum. The laser 14 directs image radiation to the mirror 11 during one half cycle to expose a line on the upper half of the drum. The laser 15 directs image radiation to the mirror 12 during the next half cycle to expose another line on the upper half of the drum. The process continues until the right-hand spinner 12 has exposed the right-hand upper quarter of the drum, and the left-hand spinner 11 has exposed the left-hand upper quarter of the drum. Therefore the entire upper half of the drum can be exposed in half the time when compared with the system of Figure 1. In addition the overall efficiency is increased since the lower half of the drum (which includes the shadow area 9) is not exposed.

[0006] A problem associated with the system of Figure 3 is that two lasers 14, 15 are required. The cost of lasers can be very high.

[0007] JP-A-4-208916 describes the supply of a synthesized light beam made up of several different wavelengths to a sequence of beam splitters, each responsive to a respective one of the wavelengths to redirect light of that wavelength towards an image recording medium.

[0008] In accordance with a first aspect of the present invention there is provided apparatus for exposing an image recording medium, the apparatus comprising an optical fibre amplifier including one or more data radiation source(s) which generate encoded radiation, a dump radiation source and a pump radiation source which pumps the optical amplifier with pump radiation,. wherein the power of the pump radiation source is greater than the power of the data radiation source(s) and the dump radiation source; a routing device comprising an input arranged to receive radiation from the optical fibre amplifier, and a plurality of imaging outputs; an energy dump; wherein the routing device selectively routes the radiation received at the input from the data radiation source(s) to a selected one of the imaging outputs and from the dump radiation source to the energy dump; and means for directing the radiation from each imaging output onto the image recording medium to expose the image recording medium.

[0009] In accordance with a second aspect of the present invention, there is provided a method of exposing an image recording medium using an optical fibre amplifier including one or more data radiation source(s) which generate encoded radiation, a dump radiation source and a pump radiation source which pumps the optical amplifier with pump radiation, wherein the power of the pump radiation source is greater than the power of the data radiation source(s) and the dump radiation source, the method comprising causing radiation from the data and dump radiation sources to be amplified; supplying the amplified radiation to one of a plurality of imaging outputs or to an energy dump respectively, depending upon its source; and exposing the image recording medium to radiation from the imaging outputs.

[0010] The present invention provides a routing device which enables a single radiation source to be used in a scanner of the type illustrated in Figure 3 and also enables an optical fibre amplifier to be used in an imaging application. This results in a much simplified system with reduced cost.

[0011] The radiation which exposes the image recording medium is encoded with image information to expose a desired pattern of pixels. Typically the radiation source inputs radiation in the form of a series of pulses to the routing device. This enables pixels to be exposed on the image recording medium with short, high power pulses, resulting in low thermal leakage.

[0012] The use of an optical amplifier having a pump energy source allows the average power of the optical amplifier to be conveniently adjusted by adjusting the power input by the pump energy source. The pump energy source preferably comprises an array of laser diodes.

[0013] The amplifier may be operated in a continuous wave mode as illustrated schematically in Figure 4. A power source (not shown) provides a power signal on input line 16. When switch 17 is closed the laser cavity 18 outputs a laser beam 19. A problem with continuous wave mode is that the output beam 19 cannot have a power any greater than the power on input line 16. This is a particular problem in thermal printing imagesetters where high laser power may be required.

[0014] Therefore preferably the amplifier is operated in pulsed mode, as illustrated schematically in Figure 5. In this case a power source provides a power signal on input line 20 which is input continuously to the laser cavity 20. The laser cavity 21 stores the energy from input line 20 until switch 22 is closed to release the energy in the form of a high power pulsed laser beam 23. As a result, the power of the pulsed laser beam 23 can be higher than the power on input line 20. This enables pixels to be exposed on the image recording medium with short, high power pulses, resulting in low thermal leakage.

[0015] An example of a suitable amplifier is shown in Figure 6. Figure 6 illustrates a fibre amplifier of the type described in WO95/10868. The fibre amplifier comprises a fibre 30 having a Erbium-Ytterbium doped single-mode inner core 31 and a multi-mode concentric outer core 32. A single mode seed laser 33 directs an encoded laser beam 34 into the inner core 31. Pump radiation is provided by a pump source 35 (an array of multi-mode laser diodes) which is coupled, transversely with respect to the optical axis of the fibre 30, to the outer core 32. The method of coupling the pump source 35 to the fibre 30 is described in detail in WO96/20519. Pump radiation from the pump source 35 propagates through the outer core 32 and couples to the amplifying inner core 31, and pumps the active material in the inner core 31. Thus the fibre optic amplifier provides a highly amplified encoded output beam 36 at the wavelength of the beam 34.

[0016] The fibre optic amplifier illustrated in Figure 6 is primarily designed for use in telecommunications in which the encoded input laser beam 34 will not be off for a significant length of time. If the seed laser 33 is off for an extended period, the fibre 30 continues to accumulate energy from the pump source 35, and as a result the fibre 30 will go into spontaneous emission. This problem is common to all pulsed laser sources and as a result pulsed laser sources are generally not used in imaging applications where the laser may be off for an extended period of time.

[0017] In order to solve this problem, the apparatus of the invention includes an energy dump; and means for directing the radiation from the radiation source either to the energy dump or to the image recording medium. This solves the spontaneous emission problem by providing an energy dump which is utilised to prevent excessive build up of energy in the radiation source.

[0018] Preferably the data radiation source(s) and a dump radiation source generate radiation at respective different wavelengths, and the routing device comprises a filter which directs the amplified radiation to the image recording medium or to the energy dump in accordance with the wavelength of the amplified radiation. In this case the apparatus typically further comprises means for encoding the radiation from the dump radiation source whereby radiation is only generated by the dump radiation source when radiation is not being generated by any of the data radiation sources. This increases efficiency and further reduces the risk of spontaneous emission. This is a particularly efficient and fast method of selectively routing the radiation from the radiation source. In particular, no acousto/optic modulators are required to encode the radiation from the radiation source.

[0019] The radiation may be transmitted through air to the image recording medium, but preferably the means for directing the radiation from each imaging output onto the image recording medium comprises a plurality of fibre-optic cables, each coupled to a respective one of the imaging outputs. This arrangement improves coupling efficiency, reduces alignment problems, and makes the apparatus safer by confining the imaging radiation beams (which may have dangerously high power). Preferably the amplifier comprises a fibre laser which provides an output suitable for coupling to the fibre-optic cables.

[0020] The apparatus may be used in a conventional imagesetter. However it is particularly suited to a thermal imagesetter in which the radiation source generates radiation of a wavelength and power suitable for exposure of a thermal imaging plate. Suitable wavelengths are in the infra-red region. Typically the image recording medium has a media sensitivity of 50-200mJcm^{-2}. Typically the average power delivered by the radiation source at the image recording medium is 2-10W (in the case where the image recording medium is exposed uniformly).

[0021] A number of examples of the present invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a side view of a conventional single mirror imagesetter;
Figure 2 is an end view of the imagesetter of Figure 1;
Figure 3 is a side view of a double mirror imagesetter;
Figure 4 is a schematic illustration of a continuous wave laser;
Figure 5 is a schematic illustration of a pulsed laser;
Figure 6 is a schematic illustration of a pulsed laser of the type described in WO95/10868 and WO96/20519;
Figure 7 is a schematic side view of a double mirror imagesetter incorporating an example of apparatus according to the present invention;
Figure 8 illustrates the surface of the drum shown in Figure 7;

Figure 9 is an example of the radiation source and control means of Figure 7;

Figure 10 illustrates a first encoding scheme for the system of Figure 9; and

Figure 11 illustrates a second encoding scheme for the system of Figure 9;

[0022] Referring to Figure 7, an internal drum thermal imagesetter comprises a drum 50 carrying one or more thermal imaging plates (not shown) on its inner surface. Two spinning mirrors 51,52 are mounted at 180° to each other on a common shaft 45 which is rotated by a motor 46 on a carriage (not shown) which is driven by a lead screw 47. An encoder 48 encodes the angular position of the shaft 45 to provide a series of pulses which are frequency multiplied by a desired factor to generate a clock signal 49 at a desired frequency (typically 20-120MHz). A laser is schematically indicated at 53, and has a pair of imaging outputs 54,55. Radiation from the imaging output 54 is input to a fibre optic cable 56 which is fixed at its far end to a lens 57 which is fixed in relation to the spinning mirror 52. Radiation from the imaging output 55 is input to a fibre optic cable 58 which is fixed at its far end to a lens 59 which is fixed in relation to the spinning mirror 51. Control means schematically indicated at 159 controls the laser 53 such that encoded radiation is selectively directed to a selected one of the spinning mirrors 51,52.

[0023] Figure 8 is a flattened representation of the outer surface of the drum 50. The shadow area 9 lies between 140° and 220° and the upper half of the drum lies between 270° and 90°. Four thermal imaging plates 60-63 are mounted on the upper half of the drum. The left-hand mirror 51 exposes plates 60 and 61 (in the upper left quarter 64 of the drum) with cyan and magenta image separations, and the right-hand mirror 52 exposes plates 62 and 63 (in the upper right quarter 65 of the drum) with yellow and black image separations.

[0024] Figure 9 illustrates a first example of the radiation source 53 and control means 159 indicated schematically in Figure 7. The radiation source 53 comprises an optical fibre laser amplifier of the type illustrated in Figure 6 (like reference numerals being used for like components) and described in WO95/105868 and WO96/20519. A suitable radiation source is the IRE-Polus YLPM-Series Pulsed Yterrbium Doped Fibre laser. Three seed lasers 73-75 comprising a pair of data lasers 73,74 and a dump laser 75 are directed at one end of the inner core 31. The seed lasers 73-75 emit radiation at slightly different wavelengths centred around a desired infra-red wavelength of approximately 1015nm. In one example the data lasers 73,74 emit radiation at 1010nm and 1020nm, and the dump laser 75 emits radiation at 1030nm. A filter 76 filters the amplified beam output from the other end of the inner core 31 and directs radiation at the wavelength of the first data laser 73 to output 54, radiation at the wavelength of the second data laser 74 to output 55, and radiation at the wavelength of the dump laser 75 to an energy dump 72. The pair of imaging outputs 54,55 (output 1 and output 2) are coupled to the fibre-optic cables 56,58. The seed lasers 73-75 are low power single mode lasers which are switched by a microprocessor 78, as described below.

[0025] The power of the pump laser diodes 35 can be selected in accordance with the desired power to be delivered on the film. The required power is determined by the media sensitivity (typically 50-200mJcm^{-2}), drum angle (typically 209 degrees), resolution (typically 48-144 lines/win), film height (typically 930mm), film width (typically 1130mm), spinner speed (typically 30,000 RPM), and optics efficiency (typically 90%). As a result the power of the pump diodes is typically selected to give an output power of 3-10W. In the example of Figure 9, the pump diodes 35 deliver 8W.

[0026] A first data store 90 contains binary image data to be recorded as a pattern of pixels on the upper left quarter of the drum 50 via first imaging output 54 (output 1). A second data store 91 contains binary image data to be recorded as a pattern of pixels on the upper right quarter of the drum via second imaging output 55 (output 2). The microprocessor 78 reads out the data from the stores 90,91 in response to the clock signal 49 from encoder 48. The microprocessor 78 controls the lasers 73-75 as described in the examples of Figures 10 and 11.

[0027] Figures 10 and 11 illustrate the radiation output by imaging output 54 (output 1), imaging output 55 (output 2) and dump output 72. The binary image data read out from data stores 90 (data 1) and 91 (data 2) are also shown, along with the clock signal 49 which has a clock period 130 of 20ns.

[0028] Figure 10 illustrates the encoding scheme when the data streams from stores 90,91 are non-overlapping, ie. when only the upper half of the drum is exposed. For the first half revolution of shaft 45 (to the left of line 110), mirror 52 (output 1) exposes a line on the upper right quarter 65 of the drum. Only part of the line is illustrated in Figure 10. For the second half revolution of shaft 45 (to the right of line 110), mirror 51 (output 2) exposes a line on the upper left quarter 64 of the drum.

[0029] The microprocessor 78 controls the seed lasers 73-75 such that a radiation pulse is output by the amplifier on each positive clock step. If data 1 is high, then a radiation pulse is output on the first output 54 to expose a single pixel. If data 2 is high, then a radiation pulse is output on the second output 55 to exposes a single pixel. If neither data lines are high, then a radiation pulse is output to energy dump 72. Therefore the dump laser 75 is encoded as NOT(DATA1 OR DATA2). In the encoding scheme of Figure 10 (in which only the upper half of the drum is exposed) it can be seen that data 1 and data 2 are never high at the same time.

[0030] For example, at the first positive clock step 100, neither data 1 nor data 2 are high. Therefore the microprocessor 78 causes the dump laser 75 to emit a 2ns pulse which is amplified to generate a 2ns amplified radiation pulse 101 to be output to the energy dump 72. After a short time lag 140 (exaggerated in Figure 10 for illustrative purposes) after the positive clock pulse 100, the microprocessor receives a pulse 103 from store 90. Hence at the second positive clock step 102, data 1 is high and the microprocessor 78 causes the laser 73 to emit a 2ns pulse which causes an amplified 2ns radiation pulse 104 to be emitted from output 54.

[0031] The duration of the pulses emitted by the seed lasers 73-75 can be adjusted by an RS 232 command before running an image. The pulse duration can be set equal to the clock period of 20ns, resulting in a continuous wave mode in which the pulses 101,104 are not temporally separated, and in which radiation is continuously input to the filter 76. However preferably the pulse duration is set to less than the 20ns clock period (for instance 2ns as shown in Figure 10), resulting in a pulsed mode in which the pulses are temporally separated (in the example of Figure 10 by 18ns) and in which radiation is input as a series of pulses to the filter 76. The total energy deposited over a 20ns clock cycle is the same in both continuous and pulsed mode, and is set by the power of the pump diodes 35 (in this case 8W*20ns=0.16 microjoules). However it is preferable to deposit this energy in a short time (eg. 1 or 2 ns) since this results in less thermal leakage. In addition the energy deposited on the film convolves less across the film when the pulse duration is short.

[0032] Figure 11 illustrates an alternative encoding scheme which is required when the data 1 and data 2 are overlapping (for instance if the drum is to be exposed in the complete area outside the shadow area 9, ie. from 220° to 140°). In this case the microprocessor 78 controls the seed lasers 73-75 such that a radiation pulse is output by the amplifier on each positive clock step and each negative clock step. If data 1 is high during a positive clock step, then a radiation pulse is output on the first output 54. If data 2 is high during a negative clock step, then a radiation pulse is output on the second output 55. Otherwise a radiation pulse is output to energy dump 72. As a result, due to the reduced storage time, the energy delivered by each pulse is half the energy delivered by the pulses in Figure 10.

[0033] For example, at negative clock step 120, data 1 and data 2 are both low and therefore the dump laser 75 emits a seed pulse which generates an amplified radiation pulse 121 which is directed to dump 72. At positive clock step 122, data 1 is high and therefore laser 73 emits a seed pulse which generates an amplified radiation pulse 123 which is directed to the first output 54. At the next negative clock step 124, data 2 is high and therefore laser 74 emits a seed pulse which generates an amplified radiation pulse 125 which is directed to the second output 55.

[0034] In the example of Figure 11, both edges of the clock are used but in a first alternative two clocks may be run in quadrature, each controlling one of the data channels; or in a second alternative the clock may be run at twice the frequency of the clock in Figure 10, each channel being controlled by alternate positive clock steps.

Claims

1. Apparatus for exposing an image recording medium, the apparatus comprising an optical fibre amplifier (53) including one or more data radiation source(s) (73, 74) which generate encoded radiation, a dump radiation source (75) and a pump radiation source (35) which pumps the optical amplifier with pump radiation, wherein the power of the pump radiation source is greater than the power of the data radiation source(s) and the dump radiation source; a routing device (76) comprising an input arranged to receive radiation from the optical fibre amplifier, and a plurality of imaging outputs (54,55); an energy dump (72); wherein the routing device (76) selectively routes the radiation received at the input from the data radiation source(s) to a selected one of the imaging outputs and from the dump radiation source to the energy dump; and means (56,58) for directing the radiation from each imaging output onto the image recording medium to expose the image recording medium.

2. Apparatus according to claim 1, wherein the data and pump radiation sources (73-75) generate radiation at respective different wavelengths; and wherein the routing device (76) comprises a filter which directs the amplified radiation to the image recording medium or to the energy dump in accordance with the wavelength of the amplified radiation.

3. Apparatus according to claim 1 or claim 2, further comprising means (48) for encoding the radiation from the dump radiation source whereby radiation is only generated by the dump radiation source when radiation is not being generated by any of the data radiation sources.

4. Apparatus according to any of the preceding claims, wherein the means for directing the radiation from each imaging output onto the image recording medium comprises a plurality of fibre-optic cables (56,58), each coupled to a respective one of the imaging outputs.

5. Apparatus according to any of the preceding claims wherein the optical amplifier generates radiation at the imaging outputs (54,55) of a wavelength and power suitable for exposure of a thermal imaging plate.

6. Apparatus according to any of the preceding claims wherein the optical amplifier is adapted to input ra-

diation in the form of a series of pulses to the routing device (76).

7. Apparatus according to any of the preceding claims, wherein the radiation sources comprise lasers.

8. An imagesetter comprising a support for supporting an image recording medium to be exposed; and apparatus according to any of the preceding claims for exposing the image recordings medium.

9. A method of exposing an image recording medium using an optical fibre amplifier (53) including one or more data radiation source(s) (73,74) which generate encoded radation, a dump radiation source and a pump radiation source (35) which pumps the optical amplifier with pump radiation, wherein the power of the pump radiation source is greater than the power of the data radiation source(s) and the dump radiation source, the method comprising causing radiation from the data and dump radiation sources (73-75) to be amplified; supplying the amplified radiation to one of a plurality of imaging outputs (54,55) or to an energy dump (72) respectively, depending upon its source; and exposing the image recording medium to radiation from the imaging outputs.

10. A method according to claim 9, wherein radiation from the data and dump sources (73-75) to be amplified is selected in accordance with a clock signal.

11. A method according to claim 9 or claim 10, wherein radiation from the dump source is amplified when radiation from the data source(s) is not being amplified.

12. A method according to any of claims 9 to 11, wherein the amplified radiation is in the form of a series of pulses.

13. A method according to any of claims 9 to 12, wherein the radiation sources comprise lasers.

Patentansprüche

1. Vorrichtung zur Belichtung eines Bildaufzeichnungsmediums, mit einem optischen Faserverstärker (53), der eine oder mehrere Datenstrahlungsquelle(n) (73, 74) einschließt, die die codierte Strahlung erzeugen, eine Abschaltstrahlungsquelle (75) und eine Pumpstrahlungsquelle (35), die in den optischen Verstärker Pumpstrahlung pumpt, wobei die Leistung der Pumpstrahlungsquelle größer als die Leistung der Datenstrahlungsquelle(n) und der Abschaltstrahlungsquelle ist, einem Verteilgerät (76), das einen zum Empfangen von Strahlung von dem optischen Faserverstärker vorgesehenen Eingang aufweist, und mehrere Bildausgänge (54, 55), einen Energieabschalter (72), wobei das Verteilgerät (76) wahlweise die Strahlung an dem Eingang von den/r Datenstrahlungsquelle(n) zu einem der ausgewählten Bildausgänge und von der Abschaltstrahlungsquelle zu dem Energieabschalter lenkt, und Mittel (56, 58) zum Richten der Strahlung von jedem Bildausgang auf das Bildaufzeichnungsmedium, um das Bildaufzeichnungsmedium zu belichten.

2. Vorrichtung nach Anspruch 1, wobei die Daten und Pumpstrahlungsquellen (73-75) Strahlung bei jeweils unterschiedlichen Wellenlängen erzeugen und wobei das Verteilgerät (76) einen Filter aufweist, der die verstärkte Strahlung auf das Bildaufzeichnungsmedium oder den Energieabschalter richtet, abhängig mit der Wellenlänge der verstärkten Strahlung.

3. Vorrichtung nach Anspruch 1 oder Anspruch 2, die zusätzlich Mittel (48) zum Codieren der Strahlung von der Abschaltstrahlungsquelle aufweist, wobei die Strahlung nur durch die Abschaltstrahlungsquelle erzeugt wird, wenn keine Strahlung durch eine der Datenstrahlungsquellen erzeugt wird.

4. Vorrichtung nach einem der vorangegangenen Ansprüche, wobei die Mittel zum Richten der Strahlung von jedem Bildausgang auf das Bildaufzeichnungsmedium mehrere faseroptische Kabel (56, 58) aufweisen, von denen jedes jeweils an einen der Bildausgänge gekoppelt ist.

5. Vorrichtung nach einem der vorangegangenen Ansprüche, wobei der optische Verstärker Strahlung an den Bildausgängen (54, 55) bei einer Wellenlänge und Leistung erzeugt, die zur Belichtung einer thermischen Bildplatte geeignet ist.

6. Vorrichtung nach einem der vorangegangenen Ansprüche, wobei der optische Verstärker ausgelegt ist, um Strahlung in Form einer Pulsreihe an das Umlenkgerät (76) einzugeben.

7. Vorrichtung nach einem der vorangegangenen Ansprüche, wobei die Strahlungsquelle Laser aufweist.

8. Ein Belichter mit einem Träger zum Halten eines Bildaufzeichnungsmediums und einer Vorrichtung nach einen der vorangegangenen Ansprüche zum Belichten des Bildaufzeichnungsmediums.

9. Verfahren zum Belichten eines Bildaufzeichnungsmediums, das einen optischen Faserverstärker (53) einschließlich einer oder mehrerer Datenstrahlungsquelle(n) (73, 74) verwendet, die eine codierte Strahlung erzeugt(en), eine Abschaltstrahlungsquelle und Pumpstrahlungsquelle (35) besitzt, die in den optischen Verstärker Strahlung pumpt, wobei die Leistung der Pumpstrahlungsquelle größer als die Leistung der Datenstrahlungsquelle(n) und der Abschaltstrahlungsquelle ist, wobei das Verfahren folgendes aufweist: Verstärken der Strahlung von den Daten und Abschaltstrahlungsquellen (73-75), Versorgen einer von mehreren Bildausgängen (54) bzw. von einem Energieabschalter (72) mit der verstärkten Strahlung abhängig von ihrer Quelle und Belichten des Bildaufzeichnungsmediums mit Strahlung von den Bildausgängen.

10. Verfahren nach Anspruch 9, wobei zu verstärkende Strahlung von den Daten und Abschaltquellen (73-75) in Übereinstimmung mit einem Zeitgebersignal ausgewählt wird.

11. Verfahren nach Anspruch 9 oder Anspruch 10, wobei Strahlung von der Strahlungsquelle verstärkt wird, wenn Strahlung von der Datenquelle(n) nicht verstärkt wird.

12. Verfahren nach einem der Ansprüche 1 bis 11, wobei die verstärkte Strahlung aus einer Reihe von Pulsen besteht.

13. Verfahren nach einem der Ansprüche 9 bis 12, wobei die Strahlungsquelle Laser aufweisen.

Revendications

1. Dispositif pour exposer un support d'enregistrement d'image, le dispositif comprenant un amplificateur à fibre optique (53) comprenant une ou plusieurs sources (73,74) de rayonnement de données qui génèrent un rayonnement codé, une source de rayonnement de vidage (75) et une source de rayonnement de pompage (35) qui pompe l'amplificateur optique avec un rayonnement de pompage, dans lequel la puissance de la source de rayonnement de pompage est plus grande que la puissance de la (des) sources de rayonnement de données et de la source de rayonnement de vidage; un dispositif d'acheminement (76) comprenant une entrée disposée pour recevoir un rayonnement venant de l'amplificateur à fibre optique, et plusieurs sorties de formation d'image (54,55); un vidage d'énergie (72); dans lequel le dispositif d'acheminement (76) achemine sélectivement le rayonnement reçu à l'entrée depuis la (les) sources de rayonnement de données, vers une sortie sélectionnée parmi les sorties de formation d'image, et depuis la source de rayonnement de vidage vers le vidage d'énergie; et des moyens (56,58) pour diriger le rayonnement venant de chaque sortie de formation d'image sur le support d'enregistrement d'image, pour exposer le support d'enregistrement d'image.

2. Dispositif selon la revendication 1, dans lequel les sources (73-75) de rayonnement de données et de vidage génèrent un rayonnement à des longueurs d'ondes respectives différentes; et dans lequel le dispositif d'acheminement (76) comprend un filtre qui dirige le rayonnement amplifié vers le support d'enregistrement d'image, ou vers le vidage d'énergie, en fonction de la longueur d'onde du rayonnement amplifié.

3. Dispositif selon la revendication 1 ou la revendication 2, comprenant en outre un moyen (48) pour coder le rayonnement venant de la source de rayonnement de vidage, par lequel un rayonnement n'est généré par la source de rayonnement de vidage que lorsqu'un rayonnement n'est pas en cours de génération par l'une quelconque des sources de rayonnement de données.

4. Dispositif selon l'une quelconque des revendications précédentes, dans lequel le moyen pour diriger sur le support d'enregistrement d'image, le rayonnement venant de chaque sortie de formation d'image, comprend plusieurs câbles à fibres optiques (56,58), couplés chacun à l'une des sorties respectives de formation d'image.

5. Dispositif selon l'une quelconque des revendications précédentes, dans lequel l'amplificateur optique génère aux sorties (54,55) de formation d'image, un rayonnement d'une longueur d'onde et d'une puissance appropriées pour une exposition d'une plaque de formation d'image par voie thermique.

6. Dispositif selon l'une quelconque des revendications précédentes, dans lequel l'amplificateur optique est adapté pour envoyer un rayonnement sous la forme d'une série d'impulsions vers le dispositif d'acheminement (76).

7. Dispositif selon l'une quelconque des revendications précédentes, dans lequel les sources de rayonnement comprennent des lasers.

8. Imageuse film comprenant un support pour supporter un support d'enregistrement d'image à exposer; et dispositif selon l'une quelconque des revendications précédentes, pour exposer le support d'enregistrement d'image.

9. Procédé pour exposer un support d'enregistrement d'image utilisant un amplificateur à fibre optique (53) comprenant une ou plusieurs sources (73,74) de rayonnement de données qui génèrent un rayonnement codé, une source de rayonnement de vidage et une source de rayonnement de pompage (35) qui pompe l'amplificateur optique avec un rayonnement de pompage, dans lequel la puissance de la source de rayonnement de pompage est plus grande que la puissance de la (des) sources de rayonnement de données et de la source de rayonnement de vidage, le procédé comprenant les étapes consistant à produire une amplification du rayonnement venant des sources de rayonnement de données et de vidage (73-75); à envoyer le rayonnement amplifié vers une des multiples sorties (54,55) de formation d'image ou, respectivement, vers un vidage d'énergie (72), en fonction de sa source; et à exposer le support d'enregistrement d'image à un rayonnement venant des sorties de formation d'image.

10. Procédé selon la revendication 9, dans lequel le rayonnement venant des sources de données et de vidage (73-75)à amplifier est sélectionné en fonction d'un signal d'horloge.

11. Procédé selon la revendication 9 ou la revendication 10, dans lequel le rayonnement venant de la source de vidage est amplifié lorsque le rayonnement venant de la (des) sources de données n'est pas en cours d'amplification.

12. Procédé selon l'une quelconque des revendications 9 à 11, dans lequel le rayonnement amplifié est sous la forme d'une série d'impulsions.

13. Procédé selon l'une quelconque des revendications 9 à 12, dans lequel les sources de rayonnement comprennent des lasers.

Fig.1.

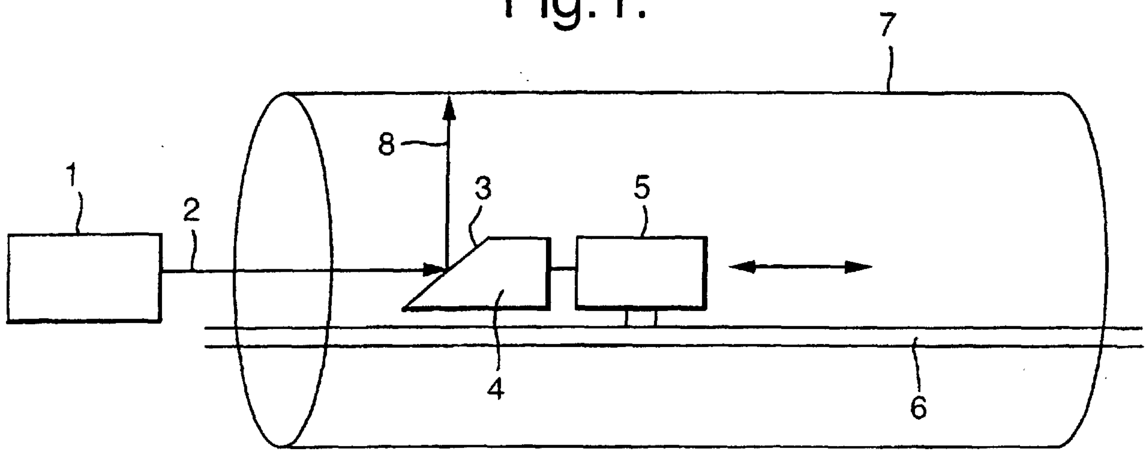


Fig.2.

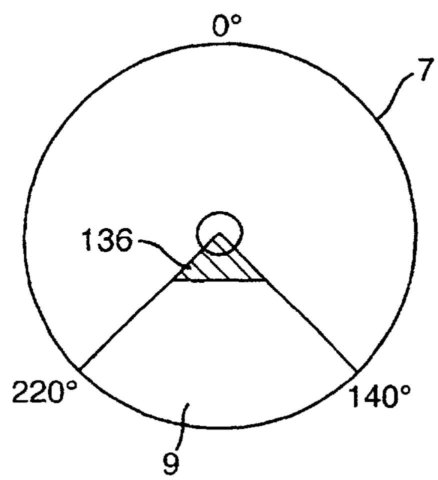


Fig.3.

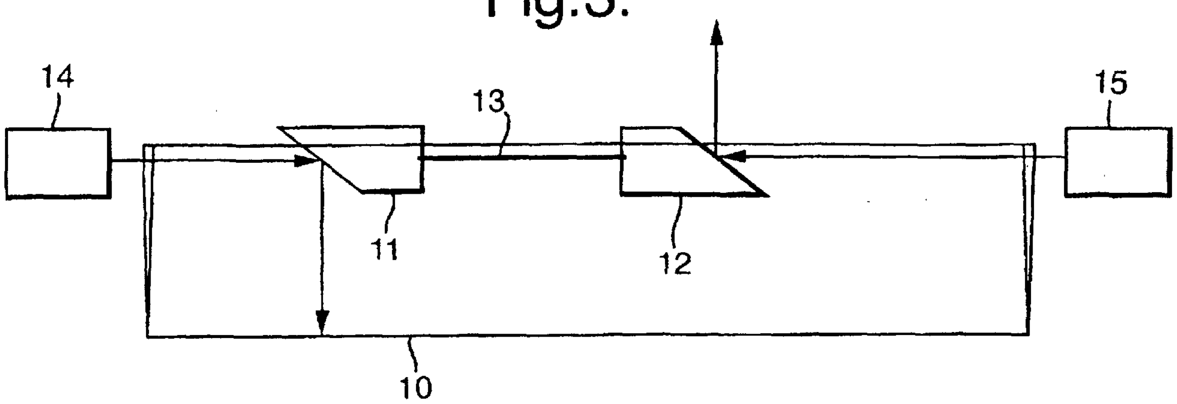


Fig.4.

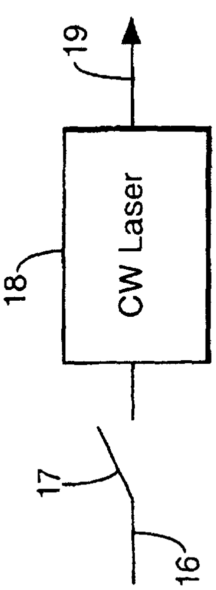


Fig.5.

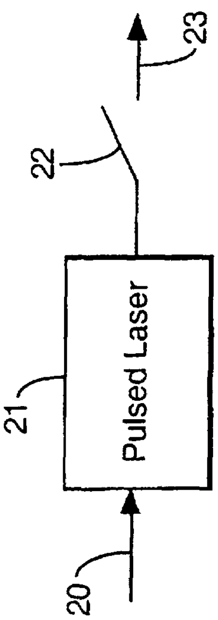


Fig.6.

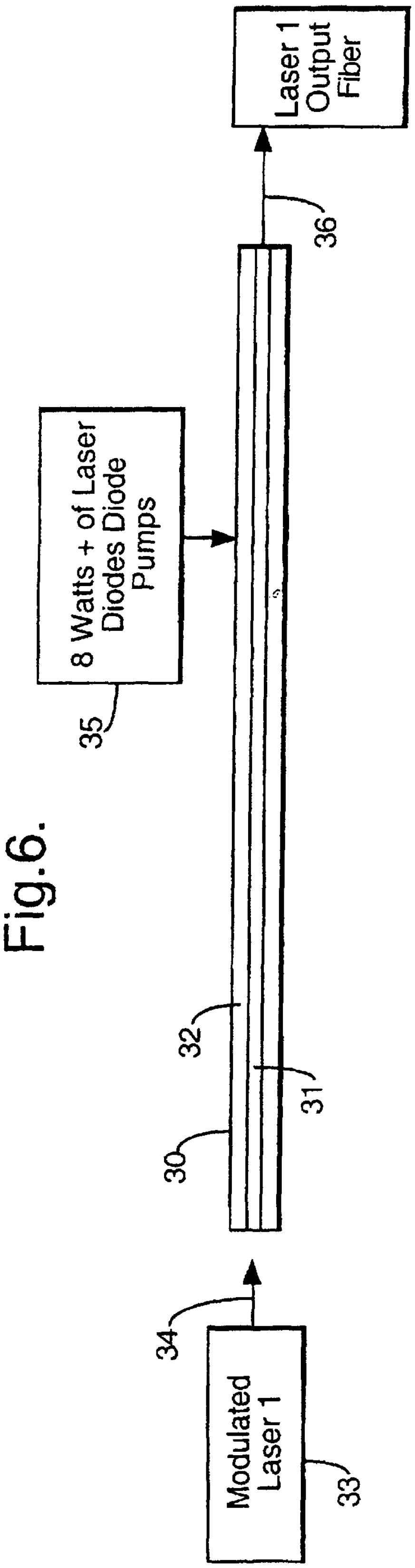


Fig.7.

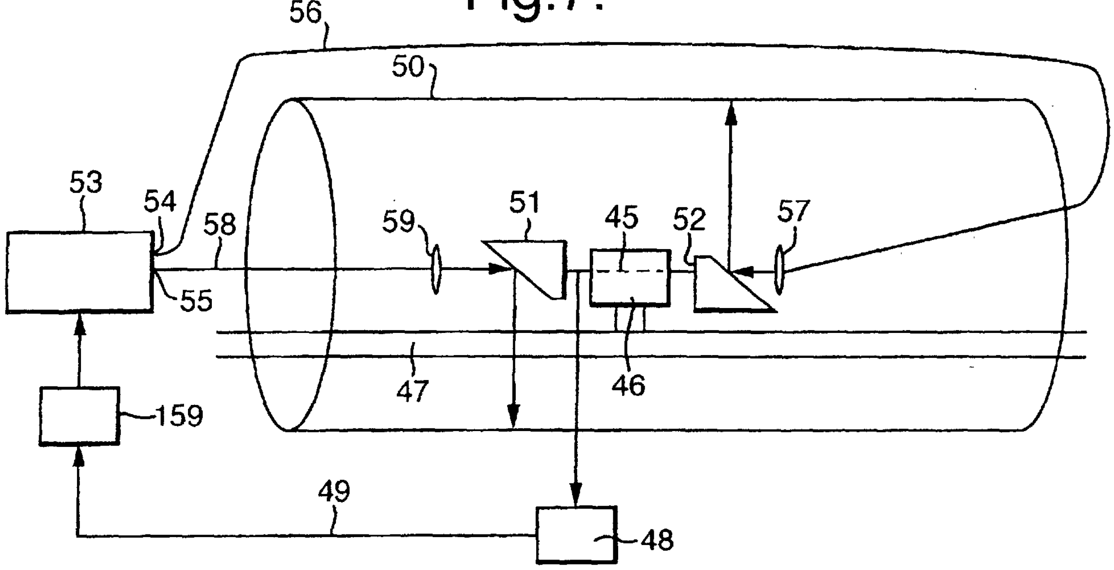
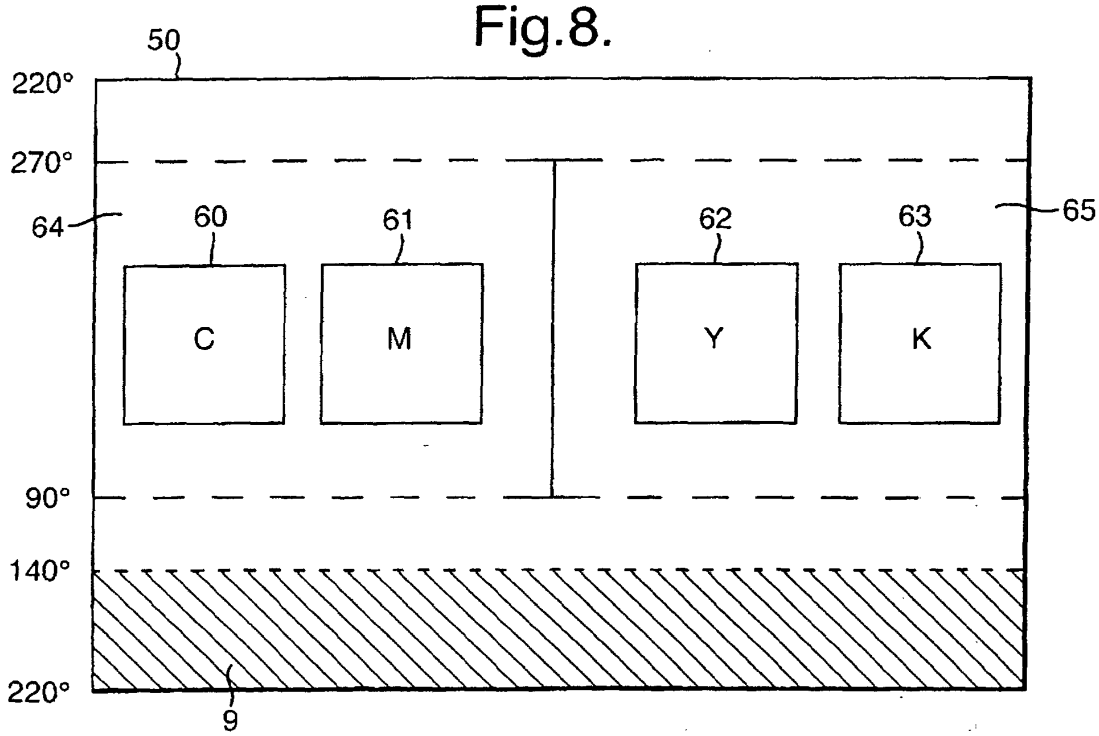

56
50
53
54
58
59
51
45
52
57
55
47
46
159
49
48

Fig.8.


50
220°
270°
64
60
61
62
63
65
C
M
Y
K
90°
140°
220°
9

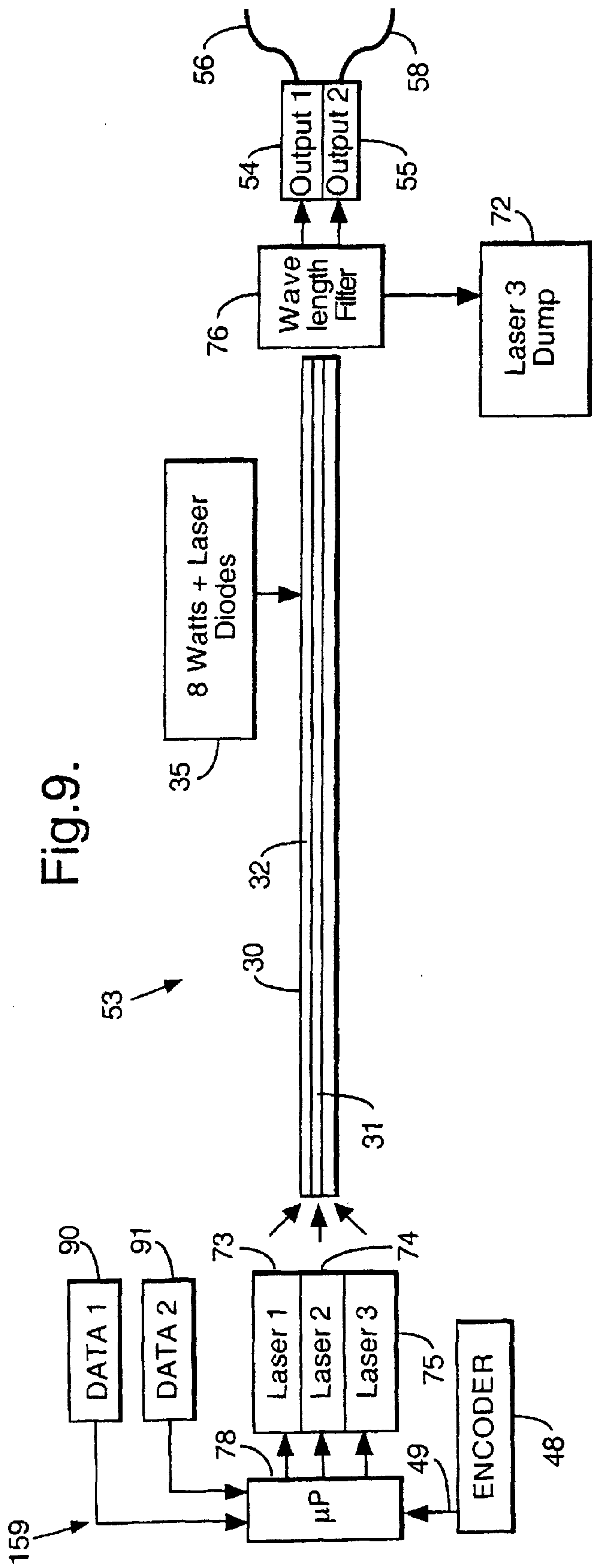

DATA 1
DATA 2
Laser 1
Laser 2
Laser 3
µP
ENCODER
8 Watts + Laser Diodes
Wave length Filter
Laser 3 Dump
Output 1
Output 2
159
90
91
73
74
75
78
49
48
31
30
32
53
35
76
72
54
55
56
58

Fig.9.

Fig.10.

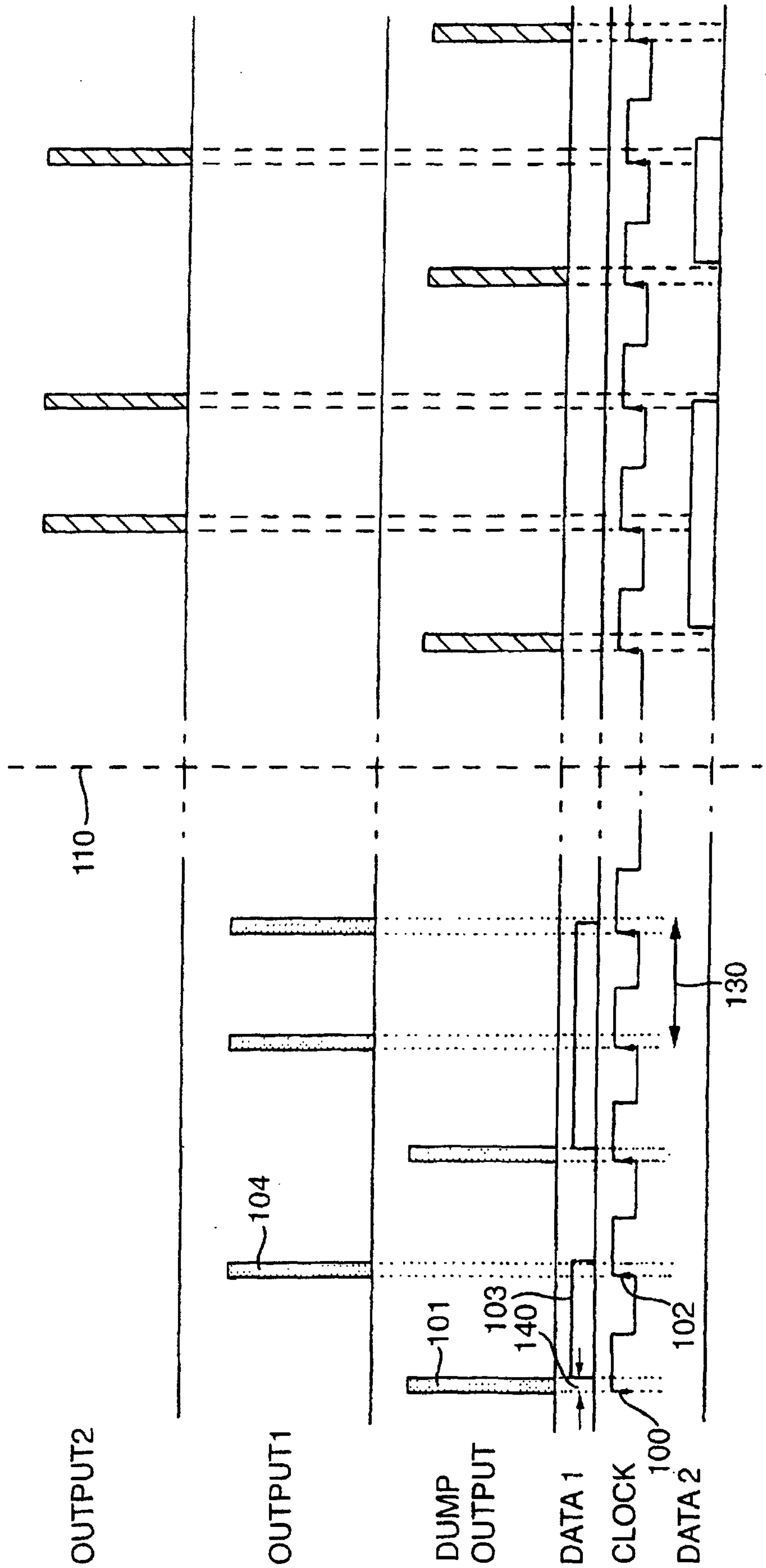
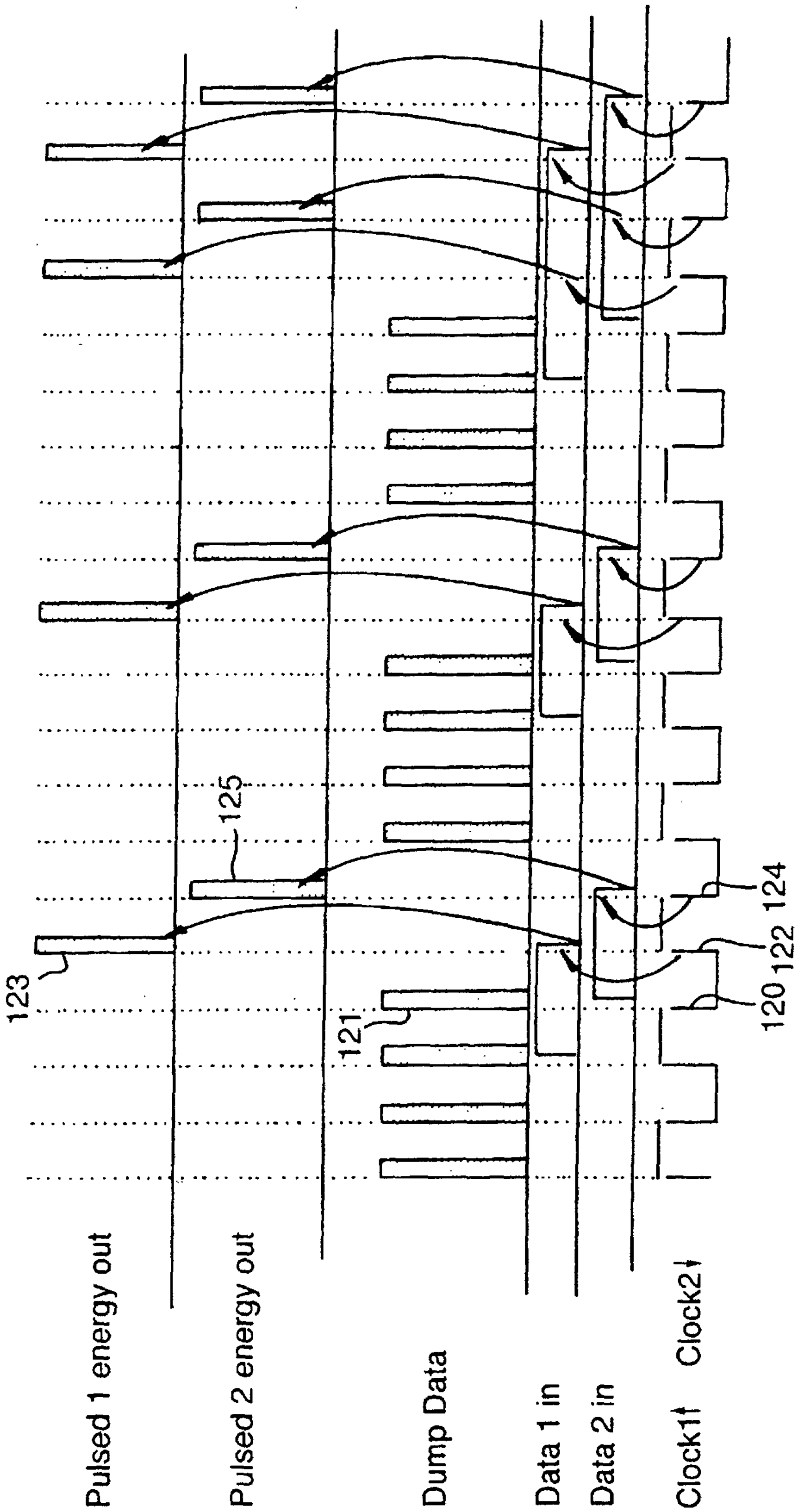

OUTPUT2
OUTPUT1
DUMP OUTPUT
DATA 1
CLOCK
DATA 2
100
101
102
103
104
110
130
140

Fig.11.


Pulsed 1 energy out
Pulsed 2 energy out
Dump Data
Data 1 in
Data 2 in
Clock1↑
Clock2↓
120
121
122
123
124
125