Description

The invention relates to a method of recording information on a record carrier having a recording layer of a thermomagnetic type, a pattern of magnetic domains having a first and a second direction of magnetisation being formed in the recording layer by scanning the recording layer with a magnetic field which is modulated depending on an information signal and at the same time, by applying radiation, heating the recording layer locally in the area being scanned to a temperature above a write temperature, above which temperature the magnetisation of the recording layer assumes a direction dictated by the magnetic field.

The invention further relates to a magneto-optical recording device for carrying out the above method, which recording device comprises a magnetic-field modulator for scanning the recording layer of the record carrier with a magnetic field which is modulated depending on an information signal, an optical system for applying, by means of a radiation beam, radiation energy to that portion of the recording layer which is scanned by the magnetic-field modulator in order to locally heat the scanned portion.

Such a method and device are described in "Philips Technical Review", Vol. 42, no. 2, pp. 38-47. In said Review it is stated that it is, in principle, possible to form the pattern of magnetic domains by scanning the recording layer with a modulated magnetic field and at the same time heating the scanned portion with a constant-intensity laser beam. At the location of the heated portion the record carrier is then magnetised in conformity with the direction dictated by the modulated magnetic field. After cooling the magnetisation of the record carrier persists, yielding a pattern of magnetic domains of opposite directions corresponding to the information signal.

The problem associated with this method, as stated in the above magazine, i.e. an inadequate speed of reversal of the magnetic field, has now been solved. For example, the non-prepublished EP-A-0 312 143. describes a magnetic-field modulator which provides an adequate speed of reversal of the magnetic field. Since the above problem has been solved, the recording method described in the foregoing has become very attractive, because it enables previously recorded information to be readily overwritten without an additional erase operation being required.

The information is read via the rotation of the direction of polarisation upon reflection of linearly polarised light. The read quality depends on the signal-to-noise ratio of the signal being read. The noise in the read signal comprises three major noise components, namely: disc noise, resulting from imperfections of the disc; read noise resulting from imperfections in the read process; and write noise resulting from imperfections in the write process.

In the meantime the attainable quality of the discs and that of the read processes have been improved to such an extent that during reading of these discs the write noise is predominant. Therefore, if a further improvement of the signal-to-noise ratio of the read signal is required, improvements in the write process aimed at reducing the write noise being must be pursued.

Further EP-A 0.243.656 discloses an M.O.-recording apparatus in which the magnetic field oscillates with a fixed frequency and the laser beam is modulated in dependence on the information signal. In the event that a magnetic domain is to be recorded with upwards magnetization direction, the laser pulse is generated when the magnetic field reaches its maximum. In the event that a magnetic domain is to be recorded with a downwards magnetization direction the laser pulse is generated when the magnetic field reaches its minimum. So the magnetic field is not modulated in accordance with the information signal.

JP-A-60/127548 discloses a recording device with two recording heads. With a first recording head information is recorded using a light beam which is modulated in accordance with an information signal.
With the second recording head information is recorded by means of a magnet field whose polarity is modulated in accordance with an information signal. It is true that it is suggested to provide the second recording head with an auxiliary light source, but it is not disclosed that radiation pulses are generated.

JP-A-61/187141 discloses magneto-optical recording in which the magneto-optical recording layers are scanned with a magnetic field which modulates in accordance with the information to be recorded. The part of magneto-optical recording layer which is scanned by the modulated magnet field is heated by means of periodic laser pulses in order to record magnetic domains with a magnetization directed by the magnetic field. It is not disclosed that there exists a relationship between the domain jitter and the length of the time interval between the magnetic field reversals and the end of the radiation pulses.

JP-A-58/146007 discloses magneto-optical recording in which the magneto-optical recording layer is irradiated intermittent during the generation of a magnetic field pulse.

EP-A 0.243.656 which is considered, pursuant Art. 54(3)(4) EPC , as comprised in the state of the art for the contracting states AT, DE, FR, GB, IT and NL discloses a magneto-optical recorder in

which the magneto-optical recording layer is scanned by a magnetic field which is modulated in accordance with the information to be recorded. The scanned part is heated above the write temperature by means of a laser beam. The laser is switched off during the reversals of the magnetic field.

It is an object of the invention to provide a method and device as defined in the opening paragraphs, enabling the write noise to be reduced.

For the contracting states BE, ES and SE the method according to the invention is characterized in that the radiation is applied as radiation pulses, a time interval with at least a predetermined length being maintained between the instants at which the direction of the magnetic field is reversed and the instants at which the radiation pulses terminate, in such a way that at the end of the radiation pulse the magnetic field is sufficiently strong for the portion heated above the write temperature to be magnetised in the direction dictated by the magnetic field and that the domain jitter as a function of said predetermined length is substantially minimal.

For the contracting states AT, DE, FR, GB, IT and NL the method according to the invention is characterized in that the radiation is applied as radiation pulses, a time interval of at least a predetermined length being maintained between the instants at which the direction of the magnetic field is reversed and the instants at which the radiation pulses terminate, in such a way that at the end of the radiation pulse the magnetic field is sufficiently strong for the portion heated above the write temperature to be magnetised in the direction dictated by the magnetic field, and that the domain jitter as a function of said predetermined length is substantially minimal, the frequency of the radiation pulse being dual to n times the bit rate n being greater than or equal to 1.

For the contracting states BE, ES and SE the device according to the invention is characterized in that the recording device comprises means for modulating the radiation beam intensity so as to generate radiation pulses, and synchronising means for maintaining time interval with at least a predetermined length between the instants of reversal of the direction of the magnetic field and the ends of the radiation pulses, said predetermined length having a value for which the domain jitter as a function of said length is substantially minimal.

For the contracting states AT, DE, FR, GB, IT and NL the device is characterized in that the recording device comprises means for modulating the radiation-beam for maintaining a time interval with at least a predetermined length between the instants of reversal of the direction of the magnetic field and the ends of the radiation pulses, said predetermined length having a value for which the domain jitter is substantially minimal, the synchronising means being adapted to generate a periodic signal of a frequency equal to n times the bit rate, n being an integer greater than or equal to 1.

The invention is based inter alia on the recognition of the fact that the write noise is mainly caused by the positional inaccuracy of the domains being formed. In the method and the device in accordance with the invention inaccuracies in the reversal of the magnetic field hardly affect the domain positions. The domain boundaries are determined mainly by the instants at which the radiation pulses cease. These instants of the radiation pulses can be adjusted far more accurately than the instants of reversal of the magnetic field. Indeed, the amount of magnetic energy stored in the magnetic field for the required field strength of a few hundreds of oersteds (10e = 79,59 A/m) is so high that the speed with which the magnetic field can be reversed is substantially smaller than the speed with which the intensity of the radiation beam can be changed.

The fact that the record carrier is heated by means of radiation pulses has the additional advantage that during the formation of the magnetic domains the temperature gradient in the boundary region of the domains is substantially higher than the temperature gradient obtained in the case of exposure to a constant-intensity radiation beam, which also has a favourable effect on the positional accuracy of the domain boundaries.

Moreover, heating the recording layer by means of radiation pulses has the advantage that the thermal load applied to the recording layer and hence the speed with which the recording layer deforms is substantially lower than in the case of scanning with constant-intensity radiation.

A very large temperature gradient is obtained in an embodiment of the method which is characterized in that the duration of the radiation pulses is short relative to the period of the radiation pulses.

For the contracting states BE, ES and ES an embodiment of the method is characterized in that the frequency of the radiation pulses is equal to n times the bit rate, n being greater than or equal to 1.

A radiation-pulse frequency which is a multiple of the bit rate can be advantageous if the diameter of a single domain formed by means of a radiation pulse is smaller than the distance on the record carrier corresponding to the bit length. In that case it may be desirable to extend the domains representing one bit by one or more overlapping separate domains. If the diameter of the individual domains is larger than said distance it is preferred to select the frequency of the radiation pulses to be equal to the bit rate.

Moreover, it is preferred to adjust the time interval between the instant of reversal of the magnetic field and the end of the next radiation pulse in such a way that the instants of reversal of the magnetic field are situated substantially halfway between the ends of two successive radiation pulses. In that case the influence of disturbances resulting in a change of said time interval is minimal.

Embodiments of the invention will now be described in more detail, by way of example, with reference to Figs. 1 to 12, of which

Fig. 1 shows an embodiment of a device in accordance with the invention,

Figs. 2, 7 and 8 illustrate the intensity of the radiation beam, the magnetic field strength as a function of time and the resulting pattern of magnetic domains for different embodiments of the invention,

Fig. 3 shows the temperature gradient in the record carrier, when the radiation energy required for heating is applied by means of a radiation pulse,

Fig. 4 shows the temperature gradient in the record carrier, when the radiation required for heating is applied by means of a constant intensity radiation beam,

Figs. 5 and 6 show different examples of a synchronising circuit for use in the device in accordance with the invention,

Figs. 9, 10, 11 and 12 illustrate the reduction in write noise obtained by means of the method and the device in accordance with the invention.

Fig. 1 shows an embodiment of the device in accordance with the invention for recording information on a record carrier 1 provided with a thermo-magnetic recording layer 4 of a type as described in, for example, the aforementioned "Philips Technical Review", vol. 42, no. 2, pp. 38-47. The device comprises a turntable 2 and a drive means 3 for rotating the record carrier 1 about its axis. An optical scanning device is arranged opposite the rotating record carrier 1 and comprises an optical head 5 of a customary type, by means of which a radiation beam, for example a laser beam, is aimed at the record carrier, enabling the intensity of the laser beam to be modulated in conformity with a control signal Vr. For this purpose the optical head 5 may comprise for example a semiconductor laser 8 driven by the signal Vr. A magnetic-field modulator 7, arranged at the other side of the record carrier 1, opposite the optical head 5, is adapted to generate a magnetic field in the area of the recording layer 4 irradiated by the radiation beam 6. The magnetic-field modulator 7 is of a type in which the direction of the magnetic field can be modulated in conformity with a binary control signal Vm. Such a magnetic field modulator 7 is described in detail, inter alia in EP-A-0.312.143

The control signals Vr and Vm are derived from an information signal Vi by means of a synchronising circuit 9. The control signal Vr comprises such a pulse-shaped signal that the intensity I of the laser beam is controlled between a high energy level Imax and a low energy level Imin.

The control signal Vm is such that the magnetic field produced in the recording layer 7 by the magnetic-field modulator 7 alternates between a value Hp and an opposite value Hm, as is illustrated as a function of time in Fig. 2.

How the control signals Vr and Vm are derived from the information signal will be described in more detail hereinafter.

However, the write process will be explained first with reference to Figs. 2 and 3. During this write process the recording layer 4 is heated by the radiation pulses 10. The resulting temperature gradient within the recording layer in the scanning direction (x) is indicated in Fig. 3 for the case that the duration of the radiation pulses is 80 ns, the scanning speed is 1.2 m/s, and the frequency of the radiation pulses is 4.32 MHz. These values for the frequency and scanning speed correspond to the customary bit rate and scanning speed in recording digital signals in conformity with the CD standard. The reference numerals 20, 21, 22, 23, 24 and 25 represent the temperature gradients at the beginning of the radiation pulse and 20 ns, 40 ns, 60 ns, 80 ns and 100 ns after the beginning respectively. As is apparent from Fig. 3 the temperature during generation of the radiation pulses rises rapidly above the write level Ts, until at the end of the radiation pulse (after 80 ns) the maximum value is reached. Subsequently the temperature decreases rapidly to below the write level Ts. The write level Ts represents the temperature above which the direction of magnetisation of the recording layer 4 can be changed by the magnetic field thus generated.

In Fig. 2 the areas within the recording layer 4 which are heated above the write temperature Ts by the radiation pulses 10a,..., 10g are indicated by the reference numerals 11a,..., 11g.

When the generation of radiation pulses 10a ceases, the magnetic field is Hm, so that the area 11a is magnetised in a first direction defined by the direction of Hm. After the temperature of the recording layer 4 has decreased below the write temperature Ts the direction of the magnetic field is reversed.

At the end of the next radiation pulse 10b the temperature in the area 11b has increased above the write temperature Ts, so that this area 11b is magnetised in a second direction, opposite to said first direction. Since the areas 11a and 11b partly overlap one another, the direction of magnetisation

within the overlapping portion is reversed.

Subsequently, when the radiation pulse 10c is generated the area 11c is magnetised in the second direction. After this the areas 11d, 11e, 11f and 11g are magnetised, in the first and the second direction respectively, yielding a pattern of magnetic domains 35a and 35b of the first direction of magnetisation and magnetic domains 34a and 34b of the second direction of magnetisation. It is to be noted that in Fig. 2 the direction of magnetisation of the record carrier outside the domains 34 and 35 is not indicated. In reality, the recording layer outside said domains is magnetised in one of the two possible directions.

The length of the magnetic domains depends on the time intervals between the first radiation pulses 10 after two successive reversals of the magnetic field. For the domain 34a this is the time interval between the instants of generation of the radiation pulse 10b and the radiation pulse 10d.

The accuracy with which a domain is positioned strongly depends on the temperature gradient at the boundary of the area 11 and the strength of the magnetic field when the maximum temperature is reached.

The influence of variations in laser intensity ambient temperature, write sensitivity and magnetic field on the position of the domain boundary decreases as this temperature gradient increases. Shifts of the domain boundaries as a result of these parameter variations will be referred to hereinafter as "domain jitter". Since the temperature gradient in the recording layer increases as the period of time within which the radiation energy needed to heat an area above the write temperature is applied decreases, it is therefore desirable to make the duration of the radiation pulses small relative to the period of the radiation pulses. Fig. 4 by way of illustration gives the temperature gradient in the record carrier when the radiation energy required for heating the recording layer 4 is applied by means of a constant-intensity laser beam. As is evident from a comparison of Figs. 3 and 4 the temperature gradient upon heating with a constant-intensity laser beam is substantially lower (and hence the sensitivity to domain jitter is higher) than in the case of heating by radiation pulses. This domain jitter results in an increased noise level in the read signal during reading of the magnetic-domain pattern. Experiments have shown that in comparison with a write process by means of a constant-intensity laser beam the signal to noise ratio is 4 to 5 dB higher than in the case of the method in accordance with the invention. By way of illustration Fig. 12 gives the energy distribution of the read signal as a function of frequency when a signal of constant frequency fc is recorded. The reference numeral 50 gives the energy distribution in the case of recording with a constant radiation intensity. The energy distribution in the case that the signal is recorded by the method in accordance with the invention is indicated by the reference numeral 51. The horizontal portions indicate the noise levels. The height of the peak indicates the signal level.

In another experiment the inaccuracy of the domain length in a constant-laser-intensity write process was compared with the inaccuracy of the write method in accordance with the invention. The scanning speed was 1.4 m/s and the bit rate of the information signal was 4.32 MHz. In the case of the inventive method the standard deviation σ of the domain jitter was found to correspond to 17 ns and in the case of in the constant-laser-intensity write process said standard deviation was found to correspond to 21 ns.

During this measurement the phase relationship between the radiation pulses and the magnetic-field modulation was optimized. The influence of this phase relationship on the domain jitter will be described comprehensively hereinafter.

Fig. 5 shows a first example of a synchronising circuit 9 adapted to control the process of recording digital information signals Vi of a specific bit rate, as shown for example in Fig. 7.

The synchronising circuit comprises a circuit for recovering a channel clock signal Vcl of a frequency equal to the bit rate of the information signal Vi. Such a circuit may comprise a phase-detection circuit 30, which upon every zero crossing of the information signal Vc determines the phase difference between said zero crossing and the pulses of the channel clock signal Vcl generated by a voltage-controlled oscillator 31. A signal which is representative of the phase difference thus detected is applied to the control input of the voltage-controlled oscillator 31 via a loop filter 32. The phase-detection circuit 30, the loop filter 32 and the voltage-controlled oscillator 21 together constitute a phase-locked loop circuit of a customary type for recovering the channel clock signal Vcl.

The control signal Vr is derived from the channel clock signal Vcl by means of a delay circuit 33, which in response to every pulse of the channel clock signal Vcl generates a control pulse of predetermined width, which pulse is delayed by a predetermined time relative to the channel clock pulse.

The signal Vi functions as the control signal Vm for the magnetic-field modulator 7. The strength H of the magnetic field generated by the magnetic-field modulator 7 is also indicated in Fig. 7.

Fig. 7 further shows the radiation pulses 10 generated in response to the control signal Vr. Said

delay time of the delay circuit 33 is adjusted in such a way that at the end of the radiation pulses the magnetic field is sufficiently strong for the area heated above the write temperature Ts by the radiation beam to be magnetised in the direction dictated by the direction of the magnetic field.

As a result of the magnetic-field modulation and the temperature rises produced by the radiation pulses a pattern of magnetic domains 34 of the first direction of magnetisation and magnetic domains 35 of the second direction of magnetisation is formed in the recording layer 4, as is illustrated in Fig. 7. Each domain represents a sequence of bits of the same logic value, which is represented by the direction of magnetisation. The length of the domains is representative of the number of bits in the sequence.

Fig. 6 shows a second example of the synchronising circuit 9 adapted to control the process of recording analog information signals.

The circuit comprises a voltage-controlled oscillator 36 which is controlled by the analog information Vi', so that this oscillator generates a clock signal Vcl' of a frequency determined by the voltage level. The analog information signal Vi' and the clock signal Vcl' are given in Fig. 8. Fig. 8 shows only three different signal levels for the analog signal Vi'. However, it will be evident that the signal level may assume any value between a minimum and a maximum level. By means of a delay circuit 38 the control signal Vr is derived from the clock signal Vcl'. The delay circuit 38 is identical to the delay circuit 33 described with reference to Fig. 5. The control signal Vs is also derived from the clock signal Vcl'. For this purpose the synchronising circuit 9 comprises a frequency divider having an input to which the clock signal Vcl' is applied and supplying an output signal which functions as the control signal Vm. In the present embodiment the divisor of the frequency divider is four, so that the frequency of the control signal Vs is 1/4 of the frequency of the clock signal Vcl'. The control signal Vm and the field strength H of the magnetic field then generated by the magnetic-field modulator 7 are also given in Fig. 8.

Fig. 8 also shows the radiation pulses 10 generated in response to the pulses of the control signal Vr and the pattern of magnetic domains 34 and 35 produced by the magnetic-field modulation and the radiation pulses. The recorded pattern represents a frequency-modulated signal whose frequency corresponds to the signal level of the analog information signal Vi'.

This embodiment advantageously utilizes the fact that the successively heated areas 11 overlap one another, so that the length of the domains can be varied within specific limits by adapting the frequency of the radiation pulses. When the spacing between two successive pulses is so small that the areas 11 overlap one another a continuous domain is obtained.

The invention is not limited to the embodiments described in the foregoing. For example, it is possible to apply the radiation energy by means of radiation pulses whose intensity variation differs from the rectangular intensity variation shown herein. For example, the intensity level of a radiation pulse may first be given a first value which does not yet result in heating above the write temperature and briefly afterwards the intensity may be increased to a value which causes heating above the write temperature. Alternatively, the radiation pulse may comprise a plurality of subpulses, some of which serve as preheating pulses, the other radiation pulses serving as write pulses. However, it is always essential that the instant at which the temperature in the recording layer has reached the maximum value, i.e. at the end of the radiation pulse, the magnetic field strength is sufficiently high for the area heated above the write temperature to be magnetised in the direction dictated by the magnetic field.

By way of illustration the curve 40 in Fig. 10 gives the standard deviation σ of the domain jitter as a function of the time interval td between the instant at which the temperature in the recording layer 4 has reached the maximum value, i.e. at the end of the radiation pulse, and the instant at which the direction of the magnetic field is reversed in the case in that the repetition rate of the radiation pulses 10 is 4.32 MHz, the duration tr of the radiation pulses is 80 ns and the rise time of the magnetic-field modulation is 160 ns. (The associated variation of the radiation intensity I and the magnetic-field strength H are given in Fig. 9).

The curve 41 is the standard deviation of the domain jitter if the radiation-pulse duration tr is 115 ns instead of 80 ns. Moreover, the curve 42 in Fig. 10 indicates the strength of the magnetic field at the end of the radiation pulses 10. The broken line 43 represents the standard deviation of the domain jitter in the case that the radiation intensity is maintained constant.

Fig. 10 clearly shows that the domain jitter is reduced if at the end of the radiation pulse the field strength is higher than 40 % of the final value (Hmax or Hmin).

Fig. 11 again gives a curve 44 representing the standard deviation σ of the domain jitter in the case that the radiation-pulse duration tr is 80 ns and the rise time tm is 200 ns. Again it can be seen that a reduction of the domain jitter is obtained if at the end of the radiation pulses 10 the magnetic field strength is at least 40 % of the final value.

In addition to said reduction of the domain jitter, the inventive method has the advantage that

the thermal load to which the recording layer is subjected is reduced substantially. Indeed, when the recording layer is heated by radiation pulses the recording layer is heated only briefly above the write temperature, whilst in the case of heating with constant-intensity radiation the recording layer is continuously heated above the write temperature. The reduction of the thermal load results in the rate at which the material of the recording layer is deformed also being reduced. This reduction is of particular interest for uses where a record carrier with a preformed groove structure is inscribed very frequently, as is for example desirable for the temperorary storage of data. For such uses the life of the record carrier depends also on the rate at which the preformed groove structure disappears as a result of thermal loading.

Claims

Claims for the following Contracting States : AT, DE, FR, GB, IT, NL

1. A method of recording information on a record carrier (1) having a recording layer (4) of a thermomagnetic type, a pattern of magnetic domains (34, 35) having a first and second direction of magnetisation being formed in the recording layer (4) by scanning the recording layer (4) with a magnetic field which is modulated depending on an information signal (Vi) having a specific bit rate and at the same time, by applying radiation, heating the recording layer locally in the area (11) being scanned to a temperature above a write temperature, above which temperature the magnetisation of the recording layer assumes a direction dictated by the magnetic field, characterized in that the radiation is applied as radiation pulses (10), a time interval (td) of at least a predetermined length being maintained between the instants at which the direction of the magnetic field (11) is reversed and the instants at which the radiation pulses (10) terminate, in such a way that at the end of the radiation pulse the magnetic field is sufficiently strong for the portion heated above the write temperature to be magnetised in the direction dictated by the magnetic field, and that the domain jitter as a function of said predetermined length is substantially minimal, the frequency of the radiation pulses being equal to n times the bit rate n being greater than or equal to 1.

2. A method as claimed in Claim 1, characterized in that the duration of the radiation pulses is short relative to the period the radiation pulses.

3. A method as claimed in Claim 1 or 2, characterized in that n is 1.

4. A method as claimed in any one of the preceding Claims, characterized in that the instant at which the direction of the magnetic field is reversed is situated substantially halfway between the instants at which two successive radiation pulses end.

5. A magneto-optical recording device for carrying out the method as claimed in any one of the preceding Claims, which recording device comprises a magnetic-field modulator (7) for scanning the recording layer (4) of the record carrier (1) with a magnetic field which is modulated depending on an information signal having a specific bit rate, an optical system (5) for applying, by means of a radiation beam (6), radiation energy to that portion (11) of the recording layer which is scanned by the magnetic-field modulator in order to locally heat the scanned portion, characterized in that the recording device comprises means (9) for modulating the radiation-beam intensity so as to generate radiation pulses (10), and synchronising means for maintaining a time interval with at least a predetermined length between the instants of reversal of the direction of the magnetic field and the ends of the radiation pulses, said predetermined length having a value for which the domain jitter is substantially minimal, the synchronising means being adapted to generate a periodic signal of a frequency equal to n times the bit rate n being an integer greater than or equal to 1.

6. A recording device as claimed in Claim 5, characterized in that the synchronising means (9) comprises means for maintaining a specific phase relationship between the magnetic-field modulation and the radiation-beam modulation.

7. A recording device as claimed in Claim 5 or 6, characterized in that the recording device is adapted to generate radiation pulses of a duration which is short relative to the length of the time intervals between the radiation pulses.

8. A recording device as claimed in Claim 5, 6 or 7, characterized in that n is 1.

9. A recording device as claimed in Claim 6, 7 or 8, characterized in that the synchronising means comprise a phase detector (30) for determining the phase difference and means (31, 32) for adapting the periodic signal depending on the phase difference thus detected in such

the thermal load to which the recording layer is subjected is reduced substantially. Indeed, when the recording layer is heated by radiation pulses the recording layer is heated only briefly above the write temperature, whilst in the case of heating with constant-intensity radiation the recording layer is continuously heated above the write temperature. The reduction of the thermal load results in the rate at which the material of the recording layer is deformed also being reduced. This reduction is of particular interest for uses where a record carrier with a preformed groove structure is inscribed very frequently, as is for example desirable for the temperorary storage of data. For such uses the life of the record carrier depends also on the rate at which the preformed groove structure disappears as a result of thermal loading.

Claims

Claims for the following Contracting States : AT, DE, FR, GB, IT, NL

1. A method of recording information on a record carrier (1) having a recording layer (4) of a thermomagnetic type, a pattern of magnetic domains (34, 35) having a first and second direction of magnetisation being formed in the recording layer (4) by scanning the recording layer (4) with a magnetic field which is modulated depending on an information signal (Vi) having a specific bit rate and at the same time, by applying radiation, heating the recording layer locally in the area (11) being scanned to a temperature above a write temperature, above which temperature the magnetisation of the recording layer assumes a direction dictated by the magnetic field, characterized in that the radiation is applied as radiation pulses (10), a time interval (td) of at least a predetermined length being maintained between the instants at which the direction of the magnetic field (11) is reversed and the instants at which the radiation pulses (10) terminate, in such a way that at the end of the radiation pulse the magnetic field is sufficiently strong for the portion heated above the write temperature to be magnetised in the direction dictated by the magnetic field, and that the domain jitter as a function of said predetermined length is substantially minimal, the frequency of the radiation pulses being equal to n times the bit rate n being greater than or equal to 1.

2. A method as claimed in Claim 1, characterized in that the duration of the radiation pulses is short relative to the period the radiation pulses.

3. A method as claimed in Claim 1 or 2, characterized in that n is 1.

4. A method as claimed in any one of the preceding Claims, characterized in that the instant at which the direction of the magnetic field is reversed is situated substantially halfway between the instants at which two successive radiation pulses end.

5. A magneto-optical recording device for carrying out the method as claimed in any one of the preceding Claims, which recording device comprises a magnetic-field modulator (7) for scanning the recording layer (4) of the record carrier (1) with a magnetic field which is modulated depending on an information signal having a specific bit rate, an optical system (5) for applying, by means of a radiation beam (6), radiation energy to that portion (11) of the recording layer which is scanned by the magnetic-field modulator in order to locally heat the scanned portion, characterized in that the recording device comprises means (9) for modulating the radiation-beam intensity so as to generate radiation pulses (10), and synchronising means for maintaining a time interval with at least a predetermined length between the instants of reversal of the direction of the magnetic field and the ends of the radiation pulses, said predetermined length having a value for which the domain jitter is substantially minimal, the synchronising means being adapted to generate a periodic signal of a frequency equal to n times the bit rate n being an integer greater than or equal to 1.

6. A recording device as claimed in Claim 5, characterized in that the synchronising means (9) comprises means for maintaining a specific phase relationship between the magnetic-field modulation and the radiation-beam modulation.

7. A recording device as claimed in Claim 5 or 6, characterized in that the recording device is adapted to generate radiation pulses of a duration which is short relative to the length of the time intervals between the radiation pulses.

8. A recording device as claimed in Claim 5, 6 or 7, characterized in that n is 1.

9. A recording device as claimed in Claim 6, 7 or 8, characterized in that the synchronising means comprise a phase detector (30) for determining the phase difference and means (31, 32) for adapting the periodic signal depending on the phase difference thus detected in such

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a way that the phase difference is maintained substantially equal to a specified value.

10. A recording device as claimed in any one of the Claims 5 to 9, characterized in that the synchronising means are adapted to maintain such a time interval between the ends of the radiation pulses and the instants at which the magnetic-field direction is reversed that the instants of reversal are situated substantially halfway between the ends of two successive radiation pulses.

Claims for the following Contracting States : BE, ES, SE

1. A method of recording information on a record carrier (1) having a recording layer (4) of a thermomagnetic type, a pattern of magnetic domains (34,35) having a first and second direction of magnetisation being formed in the recording layer by scanning the recording layer (4) with a magnetic field which is modulated depending on an information signal (Vi) and at the same time, by applying radiation, heating the recording layer (4) locally in the area (11) being scanned to a temperature above a write temperature, above which temperature the magnetisation of the recording layer assumes a direction dictated by the magnetic field, characterized in that the radiation is applied as radiation pulses (10), a time interval with at least a predetermined length (td) being maintained between the instants at which the direction of the magnetic field (4) is reversed and the instants at which the radiation pulses (10) terminate, in such a way that at the end of the radiation pulse the magnetic field is sufficiently strong for the portion heated above the write temperature to be magnetised in the direction dictated by the magnetic field and that the domain jitter as a function of said predetermined length is substantially minimal.

2. A method as claimed in Claim 1, characterized in that the duration of the radiation pulses (10) is short relative to the period the radiation pulses.

3. A method as claimed in Claim 1 or 2, characterized in that the information signal is a digital signal of a specific bit rate, the frequency of the radiation pulses being equal to n times the bit rate, n being greater than or equal to 1.

4. A method as claimed in Claim 3, characterized in that n is 1.

5. A method as claimed in any one of the preceding Claims, characterized in that the instant at which the direction of the magnetic field is reversed is situated substantially halfway between the instants at which two successive radiation pulses end.

6. A magneto-optical recording device for carrying out the method as claimed in any one of the preceding Claims, which recording device comprises a magnetic-field modulator (17) for scanning the recording layer (4) of the record carrier (1) with a magnetic field which is modulated depending on an information signal having a specific bit rate, an optical system (5) for applying, by means of a radiation beam (6), radiation energy to that portion (11) of the recording layer which is scanned by the magnetic-field modulator in order to locally heat the scanned portion, characterized in that the recording device comprises means (9) for modulating the radiation beam intensity so as to generate radiation pulses (10), and synchronising means for maintaining time interval with at least a predetermined length between the instants of reversal of the direction of the magnetic field and the ends of the radiation pulses, said predetermined length having a value for which the domain jitter as a function of said length is substantially minimal.

7. A recording device as claimed in Claim 6, characterized in that the synchronising means (9) comprises means for maintaining a specific phase relationship between the magnetic-field modulation and the radiation-beam modulation.

8. A recording device as claimed in Claim 6 or 7, characterized in that the recording device is adapted to generate radiation pulses (10) of a duration which is short relative to the length of the time intervals between the radiation pulses.

9. A recording device as claimed in Claim 6, 7 or 8, characterized in that the information signal is a digital signal of a specific bit rate, the synchronising means (9) being adapted to generate a periodic signal of a frequency equal to n times the bit rate, n being an integer greater than or equal to 1.

10. A recording device as claimed in Claim 8, characterized in that n is 1.

11. A recording device as claimed in Claim 7, 8, 9 or 10, characterized in that the synchronising means comprise a phase detector (30) for determining the phase difference and means (31,

* C L M S *

32) for adapting the periodic signal depending on the phase difference thus detected in such a way that the phase difference is maintained substantially equal to a specified value.

12. A recording device as claimed in any one of the Claims 6 to 11, characterized in that the synchronising means are adapted to maintain such a time interval between the ends of the radiation pulses and the instants at which the magnetic-field direction is reversed that the instants of reversal are situated substantially halfway between the ends of two successive radiation pulses.

Patentansprüche

Patentansprüche für folgende Vertragsstaaten : AT, DE, FR, GB, IT, NL

1. Verfahren zur Aufzeichnung von Information auf einem Aufzeichnungsträger (1) mit einer Aufzeichnungsschicht (4) eines thermomagnetischen Typs, wobei in der Aufzeichnungsschicht (4) ein Muster magnetischer Domänen (34, 35) mit einer ersten und einer zweiten Magnetisierungsrichtung gebildet wird, und zwar durch Abtasten der Aufzeichnungsschicht (4) mit einem in Abhängigkeit von einem Informationssignal (Vi), das eine bestimmte Bitrate hat, modulierten Magnetfeld und, mittels Zuführung von Strahlung, durch gleichzeitiges lokales Erwärmen der Aufzeichnungsschicht in dem abgetasteten Gebiet (11) auf eine Temperatur oberhalb einer Schreibtemperatur, oberhalb der die Magnetisierung der Aufzeichnungsschicht eine von dem Magnetfeld auferlegte Richtung annimmt, dadurch gekennzeichnet, daß die Strahlung in Form von Strahlungsimpulsen (10) zugeführt wird, wobei ein Zeitintervall (td) von mindestens einer vorgegebenen Dauer zwischen den Zeitpunkten, zu denen sich die Richtung des Magnetfeldes (H) umkehrt und den Zeitpunkten, zu denen die Strahlungsimpulse (10) enden, aufrechterhalten wird, so daß am Ende des Strahlungsimpulses das Magnetfeld genügend stark ist, um den über die Schreibtemperatur hinaus erwärmten Teil in der von dem Magnetfeld auferlegten Richtung zu magnetisieren, und daß der Domänenjitter als Funktion der genannten vorgegebenen Dauer nahezu minimal ist, wobei die Frequenz der Strahlungsimpulse n-mal die Bitrate ist, mit n größer oder gleich 1.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Dauer der Strahlungsimpulse relativ zur Periodendauer der Strahlungsimpulse kurz ist.

3. Verfahren nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß n gleich 1 ist.

4. Verfahren nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß der Zeitpunkt, zu dem sich die Richtung des Magnetfeldes umkehrt, nahezu in der Mitte zwischen den Zeitpunkten liegt, zu denen zwei aufeinanderfolgende Strahlungsimpulse enden.

5. Magnetooptische Aufzeichnungsvorrichtung zum Ausführen des Verfahrens nach einem der vorhergehenden Ansprüche, wobei die Aufzeichnungsvorrichtung einen Magnetfeldmodulator (7) zum Abtasten der Aufzeichnungsschicht (4) des Aufzeichnungsträgers (1) mit einem in Abhängigkeit von einem Informationssignal, das eine bestimmte Bitrate hat, modulierten Magnetfeld enthält sowie ein optisches System (5) zur Zuführung von Strahlungsenergie, mittels eines Strahlungsbündels (6), an denjenigen Teil (11) der Aufzeichnungsschicht, der von dem Magnetfeldmodulator zum lokalen Erwärmen des abgetasteten Teils abgetastet wird, dadurch gekennzeichnet, daß die Aufzeichnungsvorrichtung Mittel (9) zur Modulation der Intensität des Strahlungsbündels enthält, um Strahlungsimpulse (10) zu erzeugen, und Synchronisationsmittel zum Aufrechterhalten eines Zeitintervalls von mindestens einer vorgegebenen Dauer zwischen den Zeitpunkten der Richtungsumkehr des Magnetfeldes und den Endzeitpunkten der Strahlungsimpulse, wobei die vorgegebene Dauer einen Wert hat, für den der Domänenjitter nahezu minimal ist, und das Synchronisationsmittel für das Erzeugen eines periodisches Signals eingerichtet ist, dessen Frequenz n-mal die Bitrate ist, mit n eine ganze Zahl größer oder gleich 1.

6. Magnetooptische Aufzeichnungsvorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß das Synchronisationsmittel (9) Mittel zum Aufrechterhalten einer bestimmten Phasenbeziehung zwischen der Magnetfeldmodulation und der Strahlungsbündelmodulation enthält.

7. Magnetooptische Aufzeichnungsvorrichtung nach Anspruch 5 oder 6, dadurch gekennzeichnet, daß die Aufzeichnungsvorrichtung zur Erzeugung von Strahlungsimpulsen eingerichtet ist, deren Dauer relativ zur Dauer der Zeitintervalle zwischen den Strahlungsimpulsen kurz ist.

8. Magnetooptische Aufzeichnungsvorrichtung nach Anspruch 5, 6 oder 7, dadurch gekennzeichnet, daß n gleich 1 ist.

9. Magnetooptische Aufzeichnungsvorrichtung nach Anspruch 6, 7 oder 8, dadurch gekennzeichnet, daß das Synchronisationsmittel einen Phasendetektor (30) zur Bestimmung der Phasendifferenz enthält sowie Mittel (31, 32) zur Anpassung des von der so detektierten Phasendifferenz abhängenden periodischen Signals in der Weise, daß die Phasendifferenz nahezu gleich einem bestimmten Wert bleibt.

10. Magnetooptische Aufzeichnungsvorrichtung nach einem der Ansprüche 5 bis 9, dadurch gekennzeichnet, daß die Synchronisationsmittel zum Aufrechterhalten eines solchen Zeitintervalls zwischen den Endzeitpunkten der Strahlungsimpulse und den Zeitpunkten der Richtungsumkehr des Magnetfeldes eingerichtet sind, daß die Zeitpunkte, zu denen sich die Richtung des Magnetfeldes umkehrt, nahezu in der Mitte zwischen den Endzeitpunkten zweier aufeinanderfolgender Strahlungsimpulse liegen.

Patentansprüche für folgende Vertragsstaaten : BE, ES, SE

1. Verfahren zur Aufzeichnung von Information auf einem Aufzeichnungsträger (1) mit einer Aufzeichnungsschicht (4) eines thermomagnetischen Typs, wobei in der Aufzeichnungsschicht (4) ein Muster magnetischer Domänen (34, 35) mit einer ersten und einer zweiten Magnetisierungsrichtung gebildet wird, und zwar durch Abtasten der Aufzeichnungsschicht (4) mit einem in Abhängigkeit von einem Informationssignal (Vi) modulierten Magnetfeld und, mittels Zuführung von Strahlung, durch gleichzeitiges lokales Erwärmen der Aufzeichnungsschicht in dem abgetasteten Gebiet (11) auf eine Temperatur oberhalb einer Schreibtemperatur, oberhalb der die Magnetisierung der Aufzeichnungsschicht eine von dem Magnetfeld auferlegte Richtung annimmt, dadurch gekennzeichnet, daß die Strahlung in Form von Strahlungsimpulsen (10) zugeführt wird, wobei ein Zeitintervall mit mindestens einer vorgegebenen Dauer (td) zwischen den Zeitpunkten, zu denen sich die Richtung des Magnetfeldes (H) umkehrt und den Zeitpunkten, zu denen die Strahlungsimpulse (10) enden, aufrechterhalten wird, so daß am Ende des Strahlungsimpulses das Magnetfeld genügend stark ist, um den über die Schreibtemperatur hinaus erwärmten Teil in der von dem Magnetfeld auferlegten Richtung zu magnetisieren, und daß der Domänenjitter als Funktion der genannten vorgegebenen Dauer nahezu minimal ist.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Dauer der Strahlungsimpulse relativ zur Periodendauer der Strahlungsimpulse kurz ist.

3. Verfahren nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß das Informationssignal ein digitales Signal mit bestimmter Bitrate ist, wobei die Frequenz der Strahlungsimpulse n-mal die Bitrate ist, mit n größer oder gleich 1.

4. Verfahren nach Anspruch 3, dadurch gekennzeichnet, daß n gleich 1 ist.

5. Verfahren nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß der Zeitpunkt, zu dem sich die Richtung des Magnetfeldes umkehrt, nahezu in der Mitte zwischen den Zeitpunkten liegt, zu denen zwei aufeinanderfolgende Strahlungsimpulse enden.

6. Magnetooptische Aufzeichnungsvorrichtung zum Ausführen des Verfahrens nach einem der vorhergehenden Ansprüche, wobei die Aufzeichnungsvorrichtung einen Magnetfeldmodulator (7) zum Abtasten der Aufzeichnungsschicht (4) des Aufzeichnungsträgers (1) mit einem in Abhängigkeit von einem Informationssignal, das eine bestimmte Bitrate hat, modulierten Magnetfeld enthält sowie ein optisches System (5) zur Zuführung von Strahlungsenergie, mittels eines Strahlungsbündels (6), an denjenigen Teil (11) der Aufzeichnungsschicht, der von dem Magnetfeldmodulator zum lokalen Erwärmen des abgetasteten Teils abgetastet wird, dadurch gekennzeichnet, daß die Aufzeichnungsvorrichtung Mittel (9) zur Modulation der Intensität des Strahlungsbündels enthält, um Strahlungsimpulse (10) zu erzeugen, und Synchronisationsmittel zum Aufrechterhalten eines Zeitintervalls von mindestens einer vorgegebenen Dauer zwischen den Zeitpunkten der Richtungsumkehr des Magnetfeldes und den Endzeitpunkten der Strahlungsimpulse, wobei die vorgegebene Dauer einen Wert hat, für den der Domänenjitter als Funktion der genannten Dauer nahezu minimal ist.

7. Magnetooptische Aufzeichnungsvorrichtung nach Anspruch 6, dadurch gekennzeichnet, daß das Synchronisationsmittel (9) Mittel zum Aufrechterhalten einer bestimmten Phasenbeziehung zwischen der Magnetfeldmodulation und der Strahlungsbündelmodulation enthält.

8. Magnetooptische Aufzeichnungsvorrichtung nach Anspruch 6 oder 7, dadurch gekennzeichnet, daß die Aufzeichnungsvorrichtung zur

Erzeugung von Strahlungsimpulsen (10) eingerichtet ist, deren Dauer relativ zur Dauer der Zeitintervalle zwischen den Strahlungsimpulsen kurz ist.

9. Magnetooptische Aufzeichnungsvorrichtung nach Anspruch 6, 7 oder 8, dadurch gekennzeichnet, daß das Informationssignal ein digitales Signal mit bestimmter Bitrate ist und das Synchronisationsmittel (9) eingerichtet ist, um ein periodisches Signal zu generieren, dessen Frequenz n-mal die Bitrate ist, mit n eine ganze Zahl größer oder gleich 1.

10. Magnetooptische Aufzeichnungsvorrichtung nach Anspruch 8, dadurch gekennzeichnet, daß n gleich 1 ist.

11. Magnetooptische Aufzeichnungsvorrichtung nach Anspruch 7, 8 oder 9, dadurch gekennzeichnet, daß das Synchronisationsmittel einen Phasendetektor (30) zur Bestimmung der Phasendifferenz enthält sowie Mittel (31, 32) zur Anpassung des von der so detektierten Phasendifferenz abhängenden periodischen Signals in der Weise, daß die Phasendifferenz nahezu gleich einem bestimmten Wert bleibt.

12. Aufzeichnungsvorrichtung nach einem der Ansprüche 6 bis 11, dadurch gekennzeichnet, daß die Synchronisationsmittel zum Aufrechterhalten eines solchen Zeitintervalls zwischen den Endzeitpunkten der Strahlungsimpulse und den Zeitpunkten der Richtungsumkehr des Magnetfeldes eingerichtet sind, daß die Zeitpunkte der Richtungsumkehr nahezu in der Mitte zwischen den Endzeitpunkten zweier aufeinanderfolgender Strahlungsimpulse liegen.

Revendications

Revendications pour les Etats contractants suivants : AT, DE, FR, GB, IT, NL

1. Procédé d'enregistrement d'information sur un support d'enregistrement (1) pourvu d'une couche d'enregistrement (4) de type thermomagnétique, suivant lequel une configuration de domaines magnétiques (34, 35) ayant une première et une seconde direction d'aimantation sont formés dans la couche d'enregistrement (4) en explorant la couche d'enregistrement au moyen d'un champ magnétique modulé en fonction d'un signal d'information (Vi) et en chauffant en même temps la couche d'enregistrement localement dans la zone (11) explorée jusqu'à une température supérieure à la température d'écriture par application de rayonnement et au-dessus de laquelle l'aimantation de la couche d'enregistrement prend une direction déterminée par le champ magnétique, caractérisé en ce' que le rayonnement est appliqué sous la forme d'impulsions de rayonnement (10) tout en maintenant un intervalle de temps (td) d'au moins une longueur prédéterminée (td) entre les instants où est renversée la direction du champ magnétique (H) et les instants où se terminent les impulsions de rayonnement (10), de telle manière qu'à la fin de l'impulsion de rayonnement, le champ magnétique soit suffisamment fort pour que la partie chauffée jusqu'au-dessus de la température d'écriture soit aimantée dans la direction déterminée par le champ magnétique et que la gigue de domaine en fonction de ladite longueur prédéterminée soit sensiblement minimale, la fréquence de l'impulsion de rayonnement étant égale à n fois la fréquence de bits, n étant supérieur ou égal à 1.

2. Procédé selon la revendication 1, caractérisé en ce que la durée des impulsions de rayonnement est courte par rapport à la période des impulsions de rayonnement.

3. Procédé selon la revendication 1 ou 2, caractérisé en ce que n = 1.

4. Procédé selon l'une quelconque des revendications précédentes, caractérisé en ce que l'instant où la direction du champ magnétique est renversée se situe sensiblement au milieu entre les instants où deux impulsions de rayonnement successivement prennent fin.

5. Dispositif d'enregistrement magnéto-optique pour la mise en oeuvre du procédé selon l'une quelconque des revendications précédentes, dispositif d'enregistrement comportant un modulateur de champ magnétique (7) pour explorer la couche d'enregistrement (4) du support d'enregistrement (1) par un champ magnétique modulé en fonction d'un signal d'information de fréquence de bits déterminée, un système optique (5) pour appliquer, au moyen d'un faisceau de rayonnement (6), de l'énergie de rayonnement à la partie (11) de la couche d'enregistrement, explorée par le modulateur de champ magnétique, pour chauffer localement la partie explorée, caractérisé en ce qu'il comporte des moyens (9) pour moduler l'intensité du faisceau de rayonnement de façon à engendrer des impulsions de rayonnement (10), et des moyens de synchronisation pour maintenir un intervalle de temps d'au moins une longueur prédéterminée entre les instants de renversement de la direction du champ

magnétique et les fins des impulsions de rayonnement (10), ladite longueur prédéterminée ayant une valeur pour laquelle la gigue de domaine est sensiblement minimale, les moyens de synchronisation étant conçus pour engendrer un signal périodique de fréquence égale à n fois la fréquence de bits, n étant un entier supérieur ou égal à 1.

6. Dispositif d'enregistrement selon la revendication 5, caractérisé en ce que les moyens de synchronisation (9) comportent des moyens pour maintenir une relation de phase déterminée entre la modulation de champ magnétique et la modulation du faisceau de rayonnement.

7. Dispositif d'enregistrement selon la revendication 5 ou 6, caractérisé en ce qu'il est agencé pour engendrer des impulsions de rayonnement d'une durée courte par rapport à la longueur des intervalles de temps séparant les impulsions de rayonnement.

8. Dispositif d'enregistrement selon la revendication 5, 6 ou 7, caractérisé en ce que n = 1.

9. Dispositif d'enregistrement selon la revendication 6, 7 ou 8, caractérisé en ce que les moyens de synchronisation comportent un détecteur de phase (30) pour déterminer la différence de phase et des moyens (31, 32) pour adapter le signal périodique en fonction de la différence de phase ainsi détectée, de telle manière que la différence de phase soit maintenue sensiblement égale à une valeur déterminée.

10. Dispositif d'enregistrement selon l'une quelconque des revendications 5 à 9, caractérisé en ce que les moyens de synchronisation sont agencés pour maintenir entre les fins des impulsions de rayonnement et les instants où est renversée la direction de champ magnétique un intervalle de temps tel que les instants de renversement sont situés sensiblement au milieu entre les fins des deux impulsions de rayonnement successives.

Revendications pour les Etats contractants suivants : BE, ES, SE

1. Procédé d'enregistrement d'information sur un support d'enregistrement (1) pourvu d'une couche d'enregistrement (4) de type thermomagnétique, suivant lequel une configuration de domaines magnétiques (34, 35) ayant une première et une seconde direction d'aimantation sont formés dans la couche d'enregistrement (4) en explorant la couche d'enregistrement (4) au moyen d'un champ magnétique modulé en fonction d'un signal d'information (Vi) et en chauffant en même temps la couche d'enregistrement localement dans la zone (11) explorée jusqu'à une température supérieure à la température d'écriture par application de rayonnement et au-dessus de laquelle l'aimantation de la couche d'enregistrement prend une direction déterminée par le champ magnétique, caractérisé en ce que le rayonnement est appliqué sous la forme d'impulsions de rayonnement (10) tout en maintenant un intervalle de temps d'au moins une longueur prédéterminée (td) entre les instants où est renversée la direction du champ magnétique (H) et les instants où se terminent les impulsions de rayonnement (10), de telle manière qu'à la fin de l'impulsion de rayonnement, le champ magnétique soit suffisamment fort pour que la partie chauffée jusqu'au-dessus de la température d'écriture soit aimantée dans la direction déterminée par le champ magnétique et que la gigue de domaine en fonction de ladite longueur prédéterminée soit sensiblement minimale.

2. Procédé selon la revendication 1, caractérisé en ce que la durée des impulsions de rayonnement (10) est courte par rapport à la période des impulsions de rayonnement.

3. Procédé selon la revendication 1 ou 2, caractérisé en ce que le signal d'information est un signal numérique de fréquence de bits déterminée, la fréquence des impulsions de rayonnement étant égale à n fois la fréquence de bits, n étant supérieur ou égal à 1.

4. Procédé selon la revendication 3, caractérisé en ce que n est égal à 1.

5. Procédé selon l'une quelconque des revendications précédentes, caractérisé en ce que l'instant où est renversée la direction du champ magnétique se situe sensiblement au milieu entre les instants où deux impulsions de rayonnement successives prennent fin.

6. Dispositif d'enregistrement magnéto-optique pour la mise en oeuvre du procédé selon l'une quelconque des revendications précédentes, dispositif d'enregistrement comportant un modulateur de champ magnétique (7) pour explorer la couche d'enregistrement (4) du support d'enregistrement (1) par un champ magnétique modulé en fonction d'un signal d'information de fréquence de bits déterminée, un système optique (5) pour appliquer, au moyen d'un

faisceau de rayonnement (6) de l'énergie de rayonnement à la partie (11) de la couche d'enregistrement, explorée par le modulateur de champ magnétique, pour chauffer localement la partie explorée, caractérisé en ce qu'il comporte des moyens (9) pour moduler l'intensité du faisceau de rayonnement de façon à engendrer des impulsions de rayonnement, et des moyens de synchronisation pour maintenir l'intervalle de temps d'au moins une longueur prédéterminée entre les instants de renversement de la direction du champ magnétique et les fins des impulsions de rayonnement, ladite longueur prédéterminée ayant une valeur pour laquelle la gigue de domaine en fonction de ladite longueur est sensiblement minimale.

7. Dispositif d'enregistrement selon la revendication 6, caractérisé en ce que les moyens de synchronisation (9) comportent des moyens pour maintenir une relation de phase déterminée entre la modulation de champ magnétique et la modulation du faisceau de rayonnement.

8. Dispositif d'enregistrement selon la revendication 6 ou 7, caractérisé en ce qu'il est agencé pour engendrer des impulsions de rayonnement (10) d'une durée relativement courte par rapport à la longueur des intervalles de temps séparant les impulsions de rayonnement.

9. Dispositif d'enregistrement selon la revendication 6, 7 ou 8, caractérisé en ce que le signal d'information est un signal numérique de fréquence de bits déterminée, les moyens de synchronisation (9) étant agencés pour engendrer un signal périodique de fréquence égale à n fois la fréquence de bits, n étant un entier supérieur ou égal à 1.

10. Dispositif d'enregistrement selon la revendication 8, caractérisé en ce que n = 1.

11. Dispositif d'enregistrement selon la revendication 7, 8, 9 ou 10, caractérisé en ce que les moyens de synchronisation comportent un détecteur de phase (30) pour déterminer la différence de phase et des moyens (31, 32) pour adapter le signal périodique en fonction de la différence de phase ainsi détectée, de telle manière que la différence de phase soit maintenue sensiblement égale à une valeur déterminée.

12. Dispositif d'enregistrement selon l'une quelconque des revendications 6 à 11, caractérisé en ce que les moyens de synchronisation sont agencés pour maintenir entre les fins des impulsions de rayonnement et les instants où est renversée la direction de champ magnétique un intervalle de temps tel que les instants de renversement sont situés sensiblement au milieu entre les fins de deux impulsions de rayonnement successives.