Description

The present invention relates to optical devices for the transcription of signals utilizing an information carrier illuminated by a light spot serving to inscribe or to read digital or analogue data along a preengraved track. It is known from the document Elektronik 1978 - 12, pages 31-34, to construct on an optical disc a preengraved track which is necessary for the radial positioning of a write-read head. This track is broken down into adjacent elements which are, in their turn, subdivided into sectors. The writing by ablasure of the data modifies the optical characteristics of the preengraved track.

The carrier in the form of a disc on which the information is to be inscribed has been preengraved, for example in hollows, according to a group of track elements arranged according to concentric circles or organized according to the spiral turns. The width of the track elements is chosen to be slightly less than the diameter of the light spot and these elements are separated by intertrack areas, the width of which is slightly greater than this diameter. The relief surface of the carrier receives a thin layer suitable for inscription by thermo-optical means. This arrangement of elements permits the exploration of the track before inscription, since the interaction of the read spot with the track provides a dispersed radiation of reduced intensity, while the intertrack areas are not dispersion generating.

Everything takes place from the detection point of view as if the tracks were darker than the intertracks. Any deviation from track following can thus be readily detected, by virtue of this amplitude contrast. When the layer covering the carrier is subjected to the inscribing radiation, the inscribed zones are illuminated; this contributes to the creation of a good contrast along the track. However, these illuminated zones tend to coincide with the lower density of the adjoining intertracks; this causes radial loss of the contrast which is

necessary in order to ensure a good track following.

It is thus seen that the inscription is detrimental to the good radial referencing of the tracks in all the zones where the layer has stored data. On the other hand, the track-intertrack contrast remains good in the zones which have no inscriptions.

Accordingly, the device set forth herein above necessitates the following of a track carried by the information carrier. The invention relates more particularly to the means for following said track. These means serve to ensure the exploration of the track by the light spot, and to this end they comprise an optical detection of the deviations of track following and a component for the displacement of the read spot, which component is activated with a view to compensating the deviations.

An optical transcription device customarily comprises a radiation source, an electrically controlled optical modulating means and means for permitting the following of the track to be read or recorded. The radiation source provides a beam of intensity sufficient to permit the recording on the information carrier. The beam at the output of the optical modulating means is modulated in conformity with the signals to be transcribed which are present at the input of the modulating means. The track following means comprise at least one detection means in which the radiation gives rise to a signal which acts on means for deflecting the beam in order to ensure the track following.

The exploration of the preengraved blank track does not raise any difficulties, but the situation is different in the course of the inscription and in the course of a reading effected after the data have been inscribed.

In fact, when data are recorded, the intensity of the illumination of the carrier changes in value so that the radiation reflected or transmitted by the information carrier undergoes an intensity modulation which does not exist in the read mode. The writing is generally

undertaken with beam intensities which are significantly higher than those required for the reading; this involves an untimely variation of the gain of the feedback loop which manages the following of the track. Furthermore, in the course of these sudden changes of intensity level, transient phenomena are created, which lead to instabilities which are prejudicial to the proper operation of the feedback loop. It is known from the document EP A-0,035,236 (to be considered under Article 54(3)) to hold the photodetected signal when the intensity of the beam reaches the write level. Sample and hold means maintain an acquired value of the photodetected signal just prior to the increase of intensity, this taking place until such time as this increase has ceased.

When recorded tracks are read, detection takes place of a chain of illuminated zones interspersed with zones which have remained darker, but radially the track-intertrack contrast becomes irregular because only the zones of the track which have not been recorded have maintained their initial contrast in relation to the intertracks.

The object of the present invention is to alleviate these disadvantages by adopting a sampling technique which makes the track following insensitive to the modulation of a write beam.

The document US-A-3,919,697 contains a description of a device for automatically following a track for an optical data reading and writing device comprising an information carrier, an optical radiation source associated with a lens for creating at least one spot in the reference surface of said carrier, said spot being intended to explore a track element belonging to a group of adjacent track elements; said following device comprising feedback control means causing said spot to follow said track element, photodetector means receiving a radiation emerging from the portion of said reference surface illuminated by said spot, and sampling means connecting said photodetector means to said feedback control means in order to sample the photodetected signal

during time intervals corresponding to the exploration of sites dedicated to the track following, which alternate along said track element with sites dedicated to the storage of said data. The subject of the present invention is defined in claim 1.

The invention will be better understood by means of the description, which follows, of the accompanying figures in which:

Figure 1 represents a device for the inscription of data with feedback controlled exploration of a track.

Figure 2 represents an inscription device.

Figures 3 and 4 are explanatory diagrams.

Figure 5 represents a first variant of a device according to the invention.

Figure 6 represents a second variant of a device according to the invention.

Figure 7 shows a set of explanatory diagrams.

Figure 8 represents a third variant of a device according to the invention.

In Figure 1, it is possible to see an optical inscription device with exploration which is feedback controlled with regard to the track following. The beam 100 emanating from a radiation source 1 traverses a modulator 2 in order to emerge therefrom modulated in conformity with the signal to be transcribed which is present on the input terminal E. The beam is deflected by deflecting means 3, such as, for example, a pivoting mirror. It is then focused onto a track of the information carrier 5 by a lens 4. The reference surface 101 containing the track is thus illuminated by a light spot which, for example, extends over the width "l" of the track. After transmission or reflection, the radiation which has interacted with the track is received by a photodetector means 6 from which there has emanated a signal indicative of the track following deviation by the light spot. This signal is processed by the feedback control circuit 7; a motor 8 connected to the output of the feedback control circuit 7 permits the modification of the orientation of the deflecting means 3 in such a

manner as to ensure the following of the track.

Initially, the information carrier 101 comprises a preengraving intended to represent substantively elements of blank track 110 which are disposed in concentric turns. In order to inscribe the information, the light spot projected by the lens 4 must follow a track element and form thereon by thermo-optical means a chain of permanent alterations. The arrangement of these alterations along the track element characterizes geometrically the modulating signal at two levels which commands the modulator 2. The light spot which has served to inscribe the information may then serve for the detection of the alterations in a read phase in which it is again necessary to ensure the following of the track. The feedback control loop 7, 8 which is entrusted with the track following is subjected to two types of disturbances. The disturbances of one type are observed in the course of the write phase, since the luminous intensity of the spot varies at the rhythm of the alterations to be created along the track. The others are observed in the course of the read phase, since the optical contrast is not the same, depending upon whether the spot is exploring a track portion which has been altered by the writing or a track portion which has remained intact. The gain of the feedback control loop may thus vary in magnitude and in sign, and this error may cause the feedback control to become decoupled.

Figure 2 is a representation of an optical inscription device. The beam 100 emanating from the radiation source 1 traverses the modulator 2, is deflected by the deflecting means 3 and is focused onto the information carrier 5 by the lens 4. The beam modulated, for example in transmission by the carrier 5 gives rise, in at least one photodetector means 6 to an electrical signal S. Sampling means 11 disposed at the output of the photodetector 6 extract samples of the signal S and transmit them to the input of the feedback control circuit 7. The sampling means 11 effect their extractions in the course of time intervals in which the luminous

intensity of the spot exploring the track has a neutral value corresponding to a first level of illumination of the information carrier. As a result of this, between these time intervals, the level of illumination can change without this having any effect on the operation of the track following feedback control loop. By way of non-limiting example, with regard to the circuit of Figure 2, the signal applied to the input E can adopt two values which correspond to the creation of an alteration or to the maintenance of the blank state of the track. This signal is available at the input of a control circuit 102 which may be constituted by a threshold comparator circuit 9 which receives this signal on its inverting input and on its other input a reference voltage Vref within the range between the two values to be differentiated. The output of the comparator 9 is connected to one of the inputs of an "END" gate 10 which receives on its other input a clock signal H. This clock signal supplies pulses intended to command the sample extraction in the signal delivered by the photodetector means 6. To this end, the "END" gate 10 has its output connected to the command input of the sampling means 11. While the electrical signal at the input E remains below the voltage Vref, the output of the comparator 9 is at a level which authorizes the clearing of the "AND" gate 10 by the clock signal H which is necessary in order to command the extractions by the sampling means 11.

The various signals which are present are represented in Figure 3. It has been assumed that the signal at the output of the photodetector means 6 includes a component intended to demonstrate a track following deviation. Figure 3 represents at "b", as a function of the time, the signal S at the output of the photodetector means 6, and at the same time Figure 3 "a" represents a [lacuna] applied to the input E where there alternate write phases corresponding to the exceeding of the threshold Vref and intercalating phases in which the amplitude of the signal E is below the threshold. Below the diagram (a) there are represented three portions of

adjacent tracks 110, 111 and 112 and the successive positions of the light spot 113, while exaggerating the following deviations. The write zones on the track element 110 are symbolized by areas 114 which correspond to the durations during which the threshold Vref is exceeded by the signal E. The signal S_E delivered by the sampling means 11 is a succession of samples represented at "C" in Figure 3. It will be noted that the frequency of the clock signal H is equal to the cut-off frequency of the signal E, which cut-off frequency is illustrated at "a", but this frequency could be higher, in such a manner as to extract more samples. In order to ensure a good reconstruction of the track following deviation signal, it is necessary to extract at least two samples for the highest frequency included in this wave form. The reconstruction of the track following deviation signal may be undertaken by means of a low-pass filter 17 disposed between the sampling means 11 and the feedback control circuit 7.

In Figure 3, it is seen that the signal S_E represented at (c) is formed of the areas in solid lines occupying the time intervals in which the signal E is below the threshold Vref. These areas are in themselves sufficient to provide, after smoothing, a satisfactory reproduction of the position of the light spot 113 in relation to the track element 110. Figure 3 shows that a continuous reproduction can be obtained by utilizing sample and hold means, the function of which is to extract the sample and to store its value in memory until the following extraction. This aspect is illustrated on the curve representing the signal S_E by areas in broken lines which extend the full area which precedes them.

The diagrams of Figure 3 relate to the case of an inscribed signal of digital type. The voltage Vref is advantageously within the range between the two voltage levels which are respectively required for transcribing both conditions of a digital word.

Instead of utilizing all the non-inscribed areas available as sampling windows, it is possible to adopt

a priori on the information carrier an arrangement in write blocks alternating with blank areas sufficiently close to detect correctly the form of the track following deviations.

Figure 4 shows at (a) a block arrangement of the signal E to be recorded. The write phases have a duration T_2 and they are separated by areas of duration T_1 which are specifically intended for the detection of the track following deviations. The track element 110 represented at (b) in Figure 4 is inscribable by the zones 114 only within the areas corresponding to the durations T_2. The diagram represented at (c) in Figure 4 gives, as a function of the time, the following deviation $\Delta\rho$. The curve 115 represents the progression of the deviation $\Delta\rho$. The parts 116, 117 and 118 represent the samplings effected during the non-inscribable phases of duration T_1. The referencing of the areas T_1 is undertaken by means of a flag or by any other appropriate means. The step trace which extends each sampling represents a storage in memory of the sample. In certain cases of detection of track following deviation, it may be necessary to provide a plurality of samplings between two successive write phases.

Up to this point, it has been assumed that the loop which performs the track following is disturbed by the changes of luminous intensity which are necessitated by the writing of the information along a track.

Another form of disturbance may be caused in read phase at constant illumination level. In fact, along a prerecorded track, it is possible to form zones having such an interaction with a read beam that the detection signal loses a part of the preengraving contrast and proceeds as far as inverting it. This can only disturb the operation of the track following device. In this case, the invention provides for the commanding of the sample extraction from the detected signal. For this reason, according to a first variant of a device according to the invention represented in Figure 5, the device comprises two threshold comparator circuits 9 and 14. The

first comparator 9 permits, as previously, a comparison with respect to the input signal E, while the second comparator 14 permits a comparison with respect to the signal S which is available at the output of the photodetector means 6. The signals emerging from the comparators 9 and 14 are switched by a switch 103 as a function of the mode of operation adopted. The signal selected by the switch 103 is applied to one of the inputs of the "END" gate 10 in order to authorize the passage of the clock signal H. In order to compensate the various delays and to permit a placing in coincidence of the signals at the input of the "END" gate 10, the input signal E traverses a delay circuit 12 and is then compared with a voltage VE ref in the threshold comparator 9, while the signal provided at the output of the photodetector means 6 traverses, in its case, a delay circuit 13, and is then compared with a voltage VD ref in the comparator 14. The signal emerging from the sampling means 11 is smoothed and reconstructed after passage in a low-pass filter 17. A variant of the invention, such as described and represented in Figure 5, once the reference voltages VE ref and VD ref and the delay circuits 12 and 13 have been judiciously selected, authorizes an operation of the feedback loop with protection from any disturbing phenomenon due to the sudden variations of luminous intensity of the illumination beam or to the fluctuations produced by certain passages of the track in the course of the reading.

A good choice of the code utilized for the encoding of the digital words permits the representation of the latter with two conditions without the necessity to have recourse to identification intervals between words. Thus, it is possible to have at the output of the modulator 2 only two luminous intensities. It is then advantageous to adopt a device such as represented in Figure 6, being a device in which the beam emanating from the radiation source 1 is divided into two beams, for example by a semi-transparent plate 15, a beam of low luminous intensity 104 or pilot beam and a beam of high

luminous intensity 106 or transcription beam. The two beams are focused by the lens 4 onto the reference surface 101 in such a manner as to illuminate the carrier 5 by two spots which follow one another along the preengraved track 110. The rays collected by the photodetector means 6 originating from the two light spots may lead to the creation of disturbances on the electrical signal delivered. These disturbances are eliminated by the sampling. The intensity of the pilot beam 104 is, for example, 25% of the intensity supplied by the beam emanating from the radiation source 1. The pilot beam 104, after having been deflected on a first occasion by the semi-transparent plate 15 is deflected on a second occasion by an auxiliary mirror 16. After deflection by the deflecting means 3, it is situated along a direction slightly oblique in relation to the inscription beam in front of the lens 4. The pilot beam 104, after focusing by the lens 4 onto the reference surface 101, gives a spot 105 exhibiting a low level of intensity and permitting the track following. The transcription beam 106 gives a more intense light spot 107. The signal present on the input terminal E may exhibit two conditions, namely a first condition to command the modulator 2 to transmit the transcription beam 106 and a second condition to command the modulator 2 to cut off said beam. A modulator 2 of this type operating in all or nothing is easy to produce and easy to implement. The signal present on the input terminal E being digital, it may be applied directly to the input of the "AND" gate 10, via the switch 103, without requiring a voltage comparator circuit. In order to compensate the various delays, it proves to be necessary to insert a delay circuit 12 between the input terminal E and the "AND" gate 10.

Up to this point, it has been acknowledged that the number of samples extracted was sufficient to guarantee a good reconstruction of the wave form after smoothing by the low-pass filter 17. Furthermore, this assumes that the extraction duration and the time separating two successive samples are substantiall

constant. In order to guarantee an improved following using samples which, having regard to the signal on the input terminal E exhibit a variable periodicity, it is possible to provide a storage means which cooperates with the sampling means 11 in order to store the value of a sample until the appearance of the following sample. The storage means and the sampling means are advantageously constituted by a sample and hold circuit, of which the signal available at the output traverses the low-pass filter 17 before being applied to the feedback loop. Thus, Figure 7 represents these various signals: signal at the input E at (a), signal S supplied by the photo-detector means 6 at (b) and signal at the output of the sample and hold circuit at (d). The signal at the output of the sample and hold circuit is more faithful than the signal represented at (c) and which corresponds to a simple filtering, as can be seen in Figure 7. The use of a sample and hold circuit improves, in particular the signal-noise ratio.

According to a variant of the invention, Figure 8 is a device in which the track following utilizes a detection technique based on wobbling. In the description which follows, only the feedback loop will be explicitly described, in order to achieve a better understanding of how the invention cooperates with a wobbling device. A circuit such as represented in Figure 8 comprises a local oscillator 18 which supplies an alternating signal at its output, which signal is applied to the input of an auxiliary deflecting means 19 and to one of the inputs of a synchronous detector 20. In accordance with Shannon's theorem, the frequency of the local oscillator 18 is selected to be lower than one half of the clock frequency H. The auxiliary deflecting means 19 is disposed in front of the lens 4 and, in the case represented in Figure 8, the pilot beam 104 and the transcription beam 106 traverse it. This auxiliary deflecting means 19 may be, for example, an acousto-optical deflection cell which serves to impress on the light spots 105, 107 a radial displacement at the frequency of the local oscillator 18.

The synchronous detector 20 receives on one of its inputs the signal supplied by the local oscillator 18, and on the other input the signal emanating from the photo-detector means 6 after having been sampled-stored by the sample and hold means 11 and smoothed by the low-pass filter 17. The motor 8, acting on the deflecting means 3, is commanded by the synchronous detector 20, in order to correct any error of exploration of the track.

Claims

1. A device for automatically following a track for an optical data reading and writing device comprising an information carrier, an optical radiation source (1) associated with a lens (4) for creating at least one spot in the reference surface (101) of said carrier, said spot being intended to explore a track element belonging to a group of adjacent track elements; said following device comprising feedback control means (3, 6, 7, 8) causing said spot to follow said track element, photodetector means (6) receiving a radiation emerging from the portion of said reference surface illuminated by said spot, and sampling means (11) connecting said photodetector means to said feedback control means in order to sample the photodetected signal during time intervals corresponding to the exploration of sites dedicated to the track following, characterized in that said information carrier (5) is preengraved and in that said device comprises an optical modulator (2) situated between said source and said lens, allowing an optical inscription, if the intensity of the modulated radiation exceeds a predetermined intensity threshold, and in that the sites dedicated to the track following are preengraving sites having conserved their optical characteristics, these sites being explored in the reading mode by means (13, 14) for detecting a preengraving pattern commanding said samplings.

2. A device according to claim 1, characterized in that said sampling means (11) receive on a first input said photodetected signal (S) and on a second input a signal commanding said samplings which are also performed outside the reading mode, during the writing mode, during a phase (T_1) in which said spot explores a site dedicated to the track following.

3. A device according to claim 2, characterized in that the signal commanding said samplings, during the writing, acts by switching a logic coincidence circuit (10), one input of which is connected to an outer clock

(H) in order to ensure at least one sample extraction from the photodetected signal (S) during the phase (T_1) in which said spot explores a site dedicated to the track following.

4. A device according to claim 3, characterized in that a plurality of sample extractions are performed during said phase (T_1).

5. A device according to any one of claims 2 to 4, characterized in that said sampling means (11) comprise a sample and hold circuit which stores the value of a sample until the next sample is taken.

6. A device according to any one of claims 1 to 5, characterized in that said sampling means (11) act on means (3, 8) for displacing the spot via electrical smoothing means (17).

7. A device according to any one of claims 1 to 6, characterized in that said sampling means (9, 10, 11, 14) are connected to a first input of synchronous detection means (20), a second input of which receives from a generator (18) a periodic wave form and an output of which is connected to the control input of the means for displacing said spot (3, 8), the frequency of said periodic wave form being at most equal to half the frequency of said external clock (H).

8. A device according to claim 7, characterized in that said periodic wave form is applied to said control input.

9. A device according to any one of claims 2 to 5, characterized in that the marking of a site dedicated to the track following during its exploration phase (T_1) is ensured on the information carrier by the presence of a flag.

10. A device according to any one of claims 1 to 9, characterized in that two beams are focused by a lens into said reference surface in order to produce two light spots which follow each other along a track element, one of said beams being a pilot beam and the other of said beams being a write beam intended to postengrave said data.

11. A device according to any one of the preceding claims, characterized in that said data are digital data arranged in blocks which occupy the sites dedicated to their postengraving.

12. A device according to any one of the preceding claims, characterized in that the alternating sequence of structured sites and sites intended to postengrave said data is regular.

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As printed:

Claims

1. A device for automatically following a track in an optical data reading and writing device, comprising an information carrier, a light radiation source (1) associated to a lens (4) for creating at least one spot on the reference surface (101) of said carrier, said spot being intended to explore a track element belonging to a group of adjacent track elements, said track following device comprising feedback control means (3, 6, 7, 8) allowing said spot to follow said track element, photodetector means (6) receiving a radiation from the portion of said reference surface illuminated by said spot, and sampling means (11) connecting said photodetector means to said feedback control means in order to sample the photodetected signal during time intervals corresponding to the exploration of sites dedicated to the track following, characterized in that said information carrier (5) is preengraved and that said device comprises an optical modulator (2) situated between said source and said lens, and allowing an optical inscription, if the intensity of the modulated radiation exceeds a predetermined intensity threshold, and that the sites dedicated to the track following are pre-engraving sites having conserved their optical characteristics, these sites being explored in the reading mode by means (13, 14) for detecting a pre-engraving pattern commanding said sampling.

2. A device according to claim 1, characterized in that the sampling means (11) receive on a first input said photodetected signal (S) and on a second input a signal commanding said sampling which is also performed outside the reading mode in a writing mode during a phase (T_i) in which said spot explores a site dedicated to the track following.

3. A device according to claim 2, characterized in that the signal commanding said sampling during the writing phase acts by switching a

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...incidence circuit (10), one input of ... connected to an outer clock (H) in order ...re at least one sample extraction from the ...detected signal (S) during the phase (T_1) in ...h said spot explores a site dedicated to the ...ck following.

4. A device according to claim 3, characterized in that several sample extractions are performed during said phase (T_1).

5. A device according to any one of claims 2 to 4, characterized in that said sampling means (11) comprise a sample and hold circuit which stores the value of a sample until the next sample is taken.

6. A device according to any one of claims 1 to 5, characterized in that said sampling means (11) act on means (3, 8) for displacing the spot via electrical smoothing means (17).

7. A device according to any one of claims 1 to 6, characterized in that the sampling means (9, 10, 11, 14) are connected to a first input of synchroneous detection means (20), a second input of which receives from a generator (18) a periodical wave and an output of which is connected to the control input of the means for displacing said spot (3, 8), the frequency of said periodical wave being at most equal to half the frequency of said external clock (H).

8. A device according to claim 7, characterized in that said periodical wave is applied to said control input.

9. A device according to any one of claims 2 to 5, characterized in that the marking of a site dedicated to the track following during the exploration phase (T_1) is ensured on the information carrier by the presence of a flag.

10. A device according to any one of claims 1 to 9, characterized in that two bundles are focalised by a lens onto said reference surface in order to produce two light spots which follow each other along a track element, one of these bundles being a pilot bundle and the other being a write bundle conceived to postengrave said data.

11. A device according to any one of the preceding claims, characterized in that said data are digital data arranged in blocks which occupy the sites dedicated to their postengraving.

12. A device according to any one of the preceding claims, characterized in that the alternating sequence of structurated sites and sites conceived to postengrave said data is a regular sequence.

Patentansprüche

1. Vorrichtung zur automatischen Spurverfolgung für eine optische Datenlese- und Schreibvorrichtung, mit einem Informationsträger, einer optischen Strahlungsquelle (1), die einem Objektiv (4) zugeordnet ist, um auf der Bezugsoberfläche (101) des Trägers mindestens einen zur Erfassung eines Spurelements aus einer Gruppe nebeneinanderliegender Spurelemente bestimmten Lichtfleck zu erzeugen, wobei die Verfolgevorrichtung Regelmittel (3, 6, 7, 8) aufweist, die die Verfolgung des Spurelements durch den Lichtfleck sicherstellen, wobei Lichtdetektormittel (6) eine von demjenigen Bereich der Bezugsoberfläche, der von dem Fleck beleuchtet wird, ausgehende Strahlung aufnehmen und Tastmittel (11) die Lichtdetektormittel mit den Regelmitteln verbinden, um Entnahmen des Lichtdetektorsignals in Zeitintervallen vorzunehmen, die der Untersuchung von der Pistenverfolgung gewidmeten Stellen entsprechen, dadurch gekennzeichnet, daß der Informationsträger (5) vorgraviert ist und daß die Vorrichtung einen optischen Modulator (2) aufweist, der zwischen der Quelle und dem Objektiv liegt und eine optische Beschriftung ermöglicht, wenn die Intensität der modulierten Strahlung eine vorgegebene Intensitätsschwelle überschreitet, und daß die der Spurverfolgung gewidmeten Stellen Vorgravurstellen sind, die ihre optischen Kennwerte unverändert erhalten haben und im Lesemodus von Detektormitteln (13, 14) für ein Vorgravurmotiv untersucht werden, das die Signalentnahmen veranlaßt.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Abtastmittel (11) an einem ersten Eingang das Ausgangssignal (S) des Lichtdetektors und an einem zweiten Eingang ein Signal zugeführt erhalten, das die Signalentnahmen veranlaßt, die auch außerhalb des Lesemodus während des Schreibmodus in einer Phase (T_1) durchgeführt werden, in der der Lichtfleck eine der Spurverfolgung gewidmete Stelle untersucht.

3. Vorrichtung nach Anspruch 2, dadurch gekennzeichnet, daß das die Signalentnahmen veranlassende Signal während des Schreibens durch Umschaltung eines logischen Koinzidenzkreises (10) wirksam wird, der einen an einen äußeren Takt angeschlossenen Eingang besitzt, um während der Phase (T_1), in der der Lichtfleck eine der Spurverfolgung gewidmete Stelle untersucht, mindestens eine Tastprobenentnahme des Ausgangssignals (S) des Lichtdetektors zu bewirken.

4. Vorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß mehrere Tastprobenentnahmen innerhalb dieser Phase (T_1) erfolgen.

5. Vorrichtung nach einem beliebigen der Ansprüche 2 bis 4, dadurch gekennzeichnet, daß die Tastmittel (11) einen Tast- und Haltekreis enthalten, der den Wert einer Tastprobe bis zur Erfassung der nächsten Tastprobe speichert.

6. Vorrichtung nach einem beliebigen der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß die Tastmittel (11) auf Mittel (3, 8) zur Verschiebung des Lichtflecks über elektrische Glättungsmittel (17) einwirken.

7. Vorrichtung nach einem beliebigen der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß die Tastmittel (9, 10, 11, 14) an einen ersten Eingang von Synchrondetektormitteln (20) angeschlossen sind, deren zweiter Eingang von einem Generator (18) eine periodische Welle empfängt und deren Ausgang an den Steuereingang der Lichtfleck-Verschiebemittel (3, 8) angeschlossen

bei die Frequenz der periodischen Welle ...tens gleich der Hälfte der Frequenz des ...ren Takts (H) ist

. Vorrichtung nach Anspruch 7, dadurch gekennzeichnet, daß die periodische Welle an den genannten Steuereingang angelegt wird.

9 Vorrichtung nach einem beliebigen der Ansprüche 2 bis 5, dadurch gekennzeichnet, daß die Erkennung einer der Spurverfolgung gewidmeten Stelle während der Untersuchungsphase (T.) auf den Informationsträger durch das Vorliegen einer Kennmarke sichergestellt ist.

10 Vorrichtung nach einem beliebigen der Ansprüche 1 bis 9, dadurch gekennzeichnet, daß zwei Lichtbündel von einem Objektiv auf die Bezugsoberfläche fokalisiert sind, so daß zwei Lichtflecken erzeugt werden, die entlang eines Spurelements aufeinanderfolgen, wobei eines dieser Bündel ein Pilotbündel und das andere ein Schreibbündel ist, das zur Nachgravierung der Daten bestimmt ist.

11. Vorrichtung nach einem beliebigen der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Daten Digitaldaten sind, die in Blöcken zusammengefaßt sind, welche die ihrer Nachgravierung gewidmeten Stellen besetzen.

12. Vorrichtung nach einem beliebigen der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß der Wechsel zwischen strukturierten Stellen und Stellen, die für die Nachgravierung der Daten bestimmt sind, regelmäßig ist.