The invention concerns a magneto-optical recording and/or reproduction device for a recording medium upon which data are stored not only by means of so-called pits but also in a magneto-optical layer in which for scanning the pits there serves a first laser, the wavelength λ_1 of which is selected approximately four times as large as the depth of the pits, and in which for reading the data stored in the magneto-optical layer there serves a second layer, the wavelength λ_2 of which is selected approximately twice as large as the depth of the pits.

Because such magneto-optical recording and reproduction device should be able simultaneously to read data which are stored in both pits and in a magneto-optical layer, care should be taken to ensure that the two data signals do not interfere with each other, for example, through crosstalk.

It is, therefore, the object of the invention to design a magneto-optical recording and/or reproduction device according to the preamble of claim 1 in such a way that data stored by means of the pits and also in the magneto-optical layer can be read simultaneously, without the two data signals having a disturbing effect on each other.

The invention solves this task in that the second laser is automatically adjusted to the correct wavelength, that the light emitted from the second laser is reflected from the recording medium onto a two-part photodetector, that a push-pull signal is generated from the difference of the two output signals of the two-part photodetector, the phase position of said signal being compared with the phase position of the tracking error

signal, generated by the first laser, and that the regulating signal for adjusting the wavelength λ_2 of the second laser is obtained from the phase comparison.

Figure 1 shows an embodiment of the invention;

Figures 2 and 3 show the push-pull signal;

Figure 4 shows a section through a magneto-optical disc.

As the wavelength λ_1 of the first laser is selected four times as large as the depth of the pits, the path length thereby becomes λ_2.

Consequently, the pits modulate the light emanating from the first laser, as is the case with a normal compact disc, so that the data stored in the pits can be obtained from the reflected light.

However, as the wavelength λ_2 of the second laser is selected twice as large as the depth of the pits, the path length is exactly λ_2. Consequently, the pits do not modulate the light from the second laser. Only the polarization plane of the light emanating from the second laser is rotated to the left or the right depending on the data stored in the magneto-optical layer of the recording medium so that the light of the second laser only carries the data stored in the magneto-optical layer.

It is particularly advantageous to provide a tunable laser as the second laser. The light radiating from the second laser is reflected from the recording medium onto a two-part photodetector. In order to automatically adjust the wavelength of the second laser to the best value, a push-pull signal is generated by means of the

two-part photodetector through difference formation of its two output signals. The phase of this push-pull signal, which is obtained from the light of the second laser, is compared with the phase of the tracking error signal which has been generated in a known manner and is obtained from the light of the first laser. With the same or opposite phase position the wavelength of the second laser is either too large or too small. Only when the push-pull signal becomes zero is the second laser tuned to the correct wavelength.

For automatic tuning of the second laser the push-pull signal of the second laser and the tracking error signal of the first signal are fed to the inputs of a multiplier, the output of which is connected via a low-pass filter to a servo amplifier. The adjustment signal for the second laser can be picked up at the output of the servo amplifier.

The invention is now described and explained with reference to Figure 1.

The light of the first laser 1 radiates through a collimator lens 2, a grating 3, a prismatic beam splitter 4, a dichroic mirror 5, a polarization beam splitter 6 and an objective lens 7 onto a recording medium 8, behind which a writing magnet 21 is located. The light of the second, tunable laser 10 radiates laterally through a collimator lens 9 onto the polarization beam splitter 6 which deflects the light of the second laser 10 perpendicularly so that it also radiates onto the recording medium 8. The recording medium 8 reflects the light of the second laser 10 through the objective lens 7 and the polarization beam splitter 6 to the dichroic mirror 5 which deflects it perpendicularly to a convex lens 11, behind which a

poLarization beam splitter 12 is located.

One part of the light is deflected by the polarization beam splitter 12 perpendicularly onto a photodetector 14; the other part radiates in a straight line through the polarization beam splitter 12 on to a two-part photodetector 13. The two outputs of the two-part photodetector 13 are connected to the inputs of a differential amplifier 22 which, from the output signals 13a and 13b of the two-part photodetector 13, forms the push-pull signal PS = 13a - 13b. The data signal MO retrieved in magneto-optical fashion is formed in accordance with the following equation by means of an adder and a subtracter: MO = 14a - 13a -13b. The output signal of photodetector 14 is designated 14a.

The light emitted by the first laser 1 is reflected from the recording medium 8 through the objective lens 7, the polarization beam splitter 6 and the dichroic mirror 5 back to the prismatic beam splitter 4, which deflects it perpendicularly to a convex lens 15, behind which a cylinder lens 16 is located. From the cylinder lens 16 the light of the first laser 1 radiates on to a four-quadrant photodetector 17 with four quadrants A,B,C and D, as well as two photodetectors E and F. In a known manner, the data signal OS = AS + BS + CS + DS and the focusing error signal FE = AS + CS - BS - DS are formed; the output signals of the four quadrants A, B, C and D are designated AS, BS, CS and DS. The photodetectors E and F are connected to the inputs of a differential amplifier 23, which generates the tracking error signal TE = ES - FS. The output signals of the two photodetectors E and F are designated ES and FS. The output of the differential amplifier 22 is connected to the first input, the output of the differential amplifier 23 with the other input of a multiplier 18,

the output of which is connected via a low-pass filter 19 to a servo amplifier 20. The output of the servo amplifier 20 is connected to the control input of the tunable laser 10.

The push-pull signal PS for the case of when the wavelength of the tunable laser 10 is too large is shown in Figure 2, while the push-pull signal for a wavelength of the tunable laser 10 which is too small is illustrated in Figure 3. As the tuning of the wavelength for the tunable laser 10 is carried out automatically, the depth of the pits is no longer significant. Therefore, discs with differing pit depths can be scanned.

A section through a disc is shown in Figure 4. A magneto-optical layer M lies on a substrate layer S in which pits P are provided.

* C L M S *

Claims

1. A magneto-optical recording and/or reproduction device for a recording medium (8) upon which data are stored not only by means of so-called pits but also in a magneto-optical layer, in which for scanning the pits there serves a first laser (1), the wavelength λ_1 of which is selected approximately four times as large as the depth of the pits, and in which for reading the data stored in the magneto-optical layer there serves a second layer (10), the wavelength λ_2 of which is selected approximately twice as large as the depth of the pits, characterised in that the second laser (10) is automatically adjusted to the correct wavelength, that the light emitted from the second laser (10) is reflected from the recording medium onto a two-part photodetector (13), that a push-pull signal (PS) is generated from the difference of the two output signals (13a, 13b) of the two-part photodetector (13), the phase position of said signal being compared with the phase position of the tracking error signal (TE), generated by the first laser (1), and that the regulating signal for adjusting the wavelength λ_2 of the second laser (10) is obtained from the phase comparison.

2. A magneto-optical recording and/or reproduction device according to claim 1, characterised in that the outputs of the two-part photodetector (13) are connected to the inputs of a first differential amplifier (22), the output of which is connected to the first input of a multiplier (18), that there is applied to the other input of the multiplier (18) the tracking error signal (TE) which is generated in a manner known per se by means of two photodetectors (E,F) and a second differential amplifier (23), and that the output of the multiplier (18) is connected via a low-pass filter (19) to the input of a servo amplifier (20), the output of

* C L M S *

which is connected to the control input of the adjustable laser (10).