Description

The invention relates to a scanning device for scanning an information plane in an optical record carrier by means of optical radiation, which scanning device comprises a radiation source for supplying a scanning beam and a mirror objective for focusing the scanning beam to a scanning spot in the information plane, whereby the mirror objective comprises a first radiation window which is centrally located around the optical axis of the mirror objective, a first reflector arranged around the first radiation window, a second reflector which is centally located around the optical axis, and a second radiation window located around the second reflector, the scanning beam from the source entering the mirror objective via the first radiation window, reversing its direction successively on the second reflector and on the first reflector and finally leaving the mirror objective through the second radiation window towards the record carrier. The invention also relates to a mirror objective suitable for use in such a scannning device and to an optical recording and/or reproducing apparatus provided with such a scanning device.

Scanning an information plane is to be understood to mean both scanning for reading prerecorded information from the information plane and scanning for writing information in the information plane by means of a radiation beam which is intensity-modulated in accordance with the information to be recorded.

A scanning device as described in the opening paragraph, intended for scanning an optical record carrier, is known from the German Patent Application No. DE 35 04 366. This Application describes an objective for use in an optical scannning device, comprising two mirrors whose reflective sides face each other. One or both of the mirrors can be curved. The reflective side of the first mirror faces the optical record carrier, while the reflective side of the second mirror faces the radiation source. The radiation from the radiation source reaches the second mirror through a radiation window in the centre of the first mirror. After subsequent reflection on the second and first mirror, the radiation leaves the objective through an annular radiation window around the second mirror.

The two mirrors must be mutually positioned with an accuracy of about $\lambda/10$, where λ is the wavelength of the scanning beam, to obtain a correct focusing of the scanning beam. Therefore, the substate of each mirror in the known objective is provided with a conical surface. The cooperation of these two conical surfaces simplifies the positioning of the mirrors.

The use of two substrates for the two mirrors necessitates the manufacture of two additional, high precision surfaces and an accurate alignment step in the production of the objective.

A further scanning device as described in the opening paragraph, is known from the British Patent Specification No. 1,541,596. This Specification also describes an optical scanning device which includes an objective comprising two mirrors whose reflective sides face each other. The one mirror is concave and its reflective side faces the record carrier. The other mirror, which is much smaller, is convex and its reflective side faces the radiation source. The radiation from the radiation source reaches the convex mirror via a passage in the larger concave mirror. The radiation is subsequently reflected towards the concave mirror and focused by this mirror to a radiation spot in the information plane of the record carrier.

The known objective forms part of a two-stage focusing system in which the entire mirror system is suspended in a magnetic coil with which the position of the objective with respect to the record carrier is controlled. The small mirror is mounted on a piece of piezoelectric material and can be moved up and down with the aid thereof so that a small extent of defocus is periodically produced in the information plane, which is detected by a detection device and from which subsequently a focus-error signal is derived which is used for readjusting the position of the objective by means of the magnetic coil.

By using two separate mirrors in a close working relationship with each other the known scanning device has a rather complicated structure and is sensitive to mechanical perturbations.

It is an object of the invention to provide a robust scanning device comprising a minimum number of components arranged in close working relationship with one another.

To this end the scanning device according to the invention is characterized in that the mirror objective comprises a transparent body which is bounded by a first surface on a side facing the radiation source and by a second surface on a side remote from the radiation source, said first surface having a first radiation window which is centrally located around the optical axis of the mirror objective and having a first reflector reflecting on the inside and being arranged around the first radiation window, said second surface having a second reflector reflecting on the inside and being centrally located around the optical axis of the mirror objective, and having a second radiation window located around the second reflector, the radiation path of the scanning beam from the radiation source to the record carrier entering the mirror objective via the first radiation window, reversing its direction successively on the second reflector and on the first reflector and finally leaving the mirror objective

through the second radiation window. The two mirrors are coupled with each other very directly by arranging the two facing reflectors on the surfaces of one and the same transparent body. The alignment of the two mirrors with respect to each other is determined during manufacture and can subsequently be no longer disturbed.

A mirror objective of this type is eminently suitable for use in a movable apparatus for reproducing information recorded on an optical record carrier, for example, a portable or car mounted apparatus. A scanning device according to the invention has the great advantage that the radiation path in the transparent body is folded so that the height of the scanning device can be limited and thus be built into a compact apparatus.

The scanning device according to the invention may be further characterized in that the first reflector is curved aspherically. A well-defined scanning spot can then be obtained without having to resort to arranging corrective optical elements in the radiation path of the scanning beam.

A further embodiment of the scanning device according to the invention is characterized in that the first and second reflectors are curved spherically. This embodiment may be further characterized in that the second radiation window is also curved spherically. Such scanning devices can be manufactured relatively easily because the curved surfaces of the mirror objective are spherical.

The scanning device according to the invention may be further characterized in that the transparent body comprises at least two portions manufactured from materials having different refractive indices. A considerable reduction of spherical aberration can be achieved by suitably providing radiation-refractive faces in the body.

A scanning device according to the invention can be used both for scanning a record carrier having a reflective information surface and a record carrier which is read in transmission. The scanning device according to the invention is, however, most suitable when using a record carrier having a reflective information surface. The mirror objective can then also be used to receive the radiation from the scanning spot in the information surface and to focus it on a radiation-sensitive detection system.

An embodiment of the scanning device according to the invention, which is suitable for scanning a reflective information plane and in which the scanning device includes a radiation-sensitive detection system is characterized in that the mirror objective comprises a beam-splitting element for spatially separating the beam emitted by the radiation source and the beam reflected from the information plane. The beam-separating element may be, for example, a splitting-cube or splitting-mirror arranged on the surface of the first radiation window. Such a scanning device used as a read unit is compact and robust because the essential optical elements are integrated in a single component.

The scanning device according to the invention is preferably characterized in that the beam-splitting element comprises a grating or a hologram. A grating is to be understood to mean both a conventional grating and a holographic grating or hologram. The grating or hologram may be provided on an existing surface of the transparent body of the mirror objective, or it may be arranged within the volume of the body.

An embodiment of the scanning device according to the invention is characterized in that the grating or hologram is a reflection grating or a reflection hologram which is provided on the second reflector. The grating or hologram is preferably a phase structure.

A further embodiment of the scanning device according to the invention is characterized in that the grating or hologram is a transmission grating or a transmission hologram which is provided on the first radiation window.

A further embodiment of the scanning device according to the invention is characterized in that the transparent body of the mirror objective comprises two interconnected portions and in that the grating or hologram is a transmission grating or a transmission hologram which is provided on one of the two portions on a side facing the other portion.

The use of a grating for coupling out the reflected beam provides the further advantage that focus-error detection and tracking-error detection can also be realized by means of the grating. To this end the scanning device according to the invention may, for example, be characterized in that the grating or hologram comprises at least two sub-gratings having different grating parameters. The sub-gratings differ, for example, in direction and curvature of the grating lines or in their grating period. A beam portion traversing the one grating portion is thereby deflected through a different angle than a beam portion traversing another grating portion. The distance between the radiation spots subsequently formed by the beam portions on the radiation-sensitive detection system is therefore dependent on the distance between the objective system and the information plane. Such a focus-error detection method is in principle described in "Neues aus der Technik", Volume 1980, No.6, page 3.

An embodiment of the scanning device according to the invention in which another focus-error detection method is used is characterized in that the grating or hologram has a constant or linearly varying grating period. Such a grating can introduce astigmatism in the radiation beam reflected

from the information plane, which astigmatism can be used for determining the focus-error as described, for example, in United States Patent No. 4,358,200.

The use of a mirror objective with a transparent body in a scanning device may have further advantages relating to the positioning of the radiation source and the radiation-sensitive detection system.

An embodiment of the scanning device according to the invention is therefore characterized in that the radiation source is optically connected to the first radiation window. The radiation source is then, for example, a semiconductor laser, a radiation-emissive surface of which is provided on the radiation window, or the radiation source is connected to the radiation window via an optical fibre or a series of fibres.

Furthermore an embodiment of the scanning device according to the invention, provided with a radiation-sensitive detection system, may be characterized in that the radiation-sensitive detection system is arranged on the first radiation window in the radiation path of radiation which has been reflected from the information plane and which has traversed the mirror objective.

The radiation source, the optical fibres or the radiation-sensitive detection system are secured to the first radiation window by means of, for example a transparent adhesive. This results in a single compact and robust integrated component accommodating the entire optical section of the scanning device.

The various embodiments of the scanning device according to the invention may comprise different types of radiation sources such as, for example, a single semiconductor laser, a semiconductor laser train or another radiation source which can be connected to the mirror objective directly or by means of optical fibres.

The invention will now be described in greater detail by way of example with reference to the accompanying drawings, in which

Figure 1 shows in a diagrammatic cross-section an optical scanning device according to the invention, and

Figures 2, 3 and 4 show diagrammatically the scanning device with three different embodiments of the mirror objective.

Figure 1 shows a part of an optical record carrier 10 in which an information plane 11 is provided. A scanning device whose principal elements shown are a mirror objective 30 and a radiation source 40 is provided close to the record carrier. The radiation source 40 emits a scanning beam 20 which is focussed to a scanning spot 21 in the information plane 11 by the mirror objective 30. The information plane can be covered by the scanning spot because the scanning device and the record carrier are movable with respect to each other, for example, because the record carrier can rotate around an axis (not shown) perpendicular to the plane of the record carrier and because the scanning device can move in the radial direction with respect to the same axis.

The scanning beam 20 traverses the mirror objective and the beam enters the transparent body of the objective via the first radiation window 31. Subsequently the scanning beam is reflected on the convex reflector 32 so that the scanning beam widens and is incident on substantially the entire surface of the concave reflector 33. This reflector reflects the scanning beam as a convergent beam which is focussed to a scanning spot 21 in the information plane 11 via the radiation window 34 and a portion of the transparent record carrier 10.

In the case of a reflective information surface with which, for example, the optically readable digital audio discs known under the name of "Compact Disc" are provided, the beam reflected in the spot 21 is received by the mirror objective again and traverses the reverse path therein to the radiation window 31. The reflected beam may enter the radiation source and when using a semiconductor laser as a radiation source it can be detected thereby. This so-called feedback read-out is described, for example, in German Patent Specification No. 1,584,664. Preferably, however, a beam-splitting element, for example, a splitting cube 50 through which a portion of the reflected radiation is separated from the scanning beam 20 and is projected on a radiation-sensitive detection system 60 is arranged in the common radiation path of the emitted and the reflected radiation beams. Since the radiation reflected from the information plane 11 is modulated with the information stored in said information plane and is scanned by the radiation spot, the information current is converted by the system 60 into an electrical signal to be further processed.

Figures 2, 3 and 4 show the optical scanning device according to the invention in which three different embodiments of the mirror objective are shown with a beam-splitting element in the form of a grating.

In Figure 2 the transparent body 30 has an aspherical first surface in which the first radiation window 32 is provided which is enclosed by the first reflector 33. The opposite second surface of the transparent body comprises an annular flat portion 34 via which the radiation exists, and a central circular portion 35. This portion 35 is curved and has a reflective grating, preferably a phase grating. The transparent body 30 and the radiation

windows and the reflectors are arranged optionally symmetrically around the optical axis. A radiation source 40, for example, a semiconductor laser is connected directly or via an optical fibre to the window 31 on the optical axis.

If the scanning device is intended to read information from an optical record carrier, the reflective grating preferably has such a geometry that the reflected radiation is distributed approximately uniformly in the zero diffraction order and in the first or one of the higher diffraction orders. The product of the diffraction in the zeroth order of the projected beam with the diffraction in the higher order of the returning beam is then maximal. The other orders are suppressed as much as possible. In a scanning device intended for writing information it is, however, preferred that the greater part of the radiation is reflected in the zero order, so that the scanning spot has a high intensity and that the other radiation is reflected as much as possible in the first or one of the higher diffraction orders.

The radiation from the radiation source 40 is directed by the reflector 35 towards the reflector 33 and the part of the radiation which is reflected in the zero order is focussed by the last-mentioned reflector to form the scanning spot 21 in the information plane. The radiation reflected from the information plane is reflected along the reverse path via the reflectors 33 and 35 in the window 31 of the transparent body 30. Due to the geometry of the reflective grating 35 an image point of one order is located next to the position of the radiation source 40. The radiation-sensitive detection system 60 is arranged in this image point.

Figure 3 shows a preferred embodiment of the scanning device according to the invention. This embodiment is mainly equal to the embodiment of Figure 2, except that the surface supporting the window 31 and the reflector 33 is spherical and that the transparent body 30 comprises two portions of transparent material 36 and 37 between which a transmission grating 38 is arranged.

The two portions 36 and 37 may directly engage each other in the manner as is shown in Figure or, contiguous to the transmission grating, a cavity may be left between the portions 36 and 37, which cavity is empty or is filled with a substance having a refractive index which differs considerably from the refractive indices of the materials of the two portions. If the portions 36 and 37 engage each other, the grating 38 should be a black-white grating. In the presence of a cavity it is alternatively possible to arrange a phase grating, which proves the advantage that there are no or hardly any radiation losses in the grating. The transmission grating 38 operates in an identical way as the grating 35 in Figure 2. The one portion 36 on which the reflector 31 is provided is made of, for example, the glass type BK7 of the Firm of Schott or of quartz, whilst the other portion supporting the reflector 32 is made of SFL6 or LaKN22 likewise of the Firm of Schott.

Since the transparent body comprises two portions which are made from materials having refractive indices between which there is a difference of approximately 0.3, the spherical aberration of the mirror objective is considerably less as compared with that of a homogeneous transparent body. It has been found that a difference in refractive index between approximately 0.2 and approximately 0.4 suffices for this purpose. Of course it is not necessary for the reduction of the spherical aberration to provide a grating on the interface between the portions 36 and 37 of the transparent body. On the other hand, the grating 38 may be provided within the volume of the transparent body without having to manufacture the portions 36 and 37 from materials having different refractive indices. This is, for example, the case if there is no troublesome spherical aberration due to a small numerical aperture of the mirror objective or due to the shape of the reflector 33.

Figure 3 shows a third embodiment of the optical scanning device according to the invention. In this embodiment the second radiation window 34 and the second reflector 32 are both spherically curved. In the case of a relatively small numerical aperture the radii of curvature of the reflector and the window may be equal and in the case of a larger numerical aperture different radii of curvature will often be chosen. Furthermore, the radiation reflected from the information plane 11 in this embodiment is partly coupled out and the coupled-out radiation is directed towards the radiation-sensitive detection system 60 by means of a transmission grating 39 which is arranged on the first radiation window 33 of the transparent body. In this embodiment the radiation source 40 and the radiation-sensitive detection system 60 are arranged at some distance from the radiation window 33.

The grating 39 (or the gratings 35 and 38 in Figures 2 and 3, respectively) may be composed of a plurality of sub-gratings, each having different grating parameters, such as grating period and direction and curvature of the grating lines so that the separated beam directed towards the radiation-sensitive detection system is split up in as many beams which can be used for detecting focus errors in accordance with the so-called Foucault method as described, for example in the above-cited Article in "Neues aus der Technik", Volume 1980, No. 6, page 3. If the grating has a constant or linearly varying grating period, the emerging beam may be astigmatic and focus errors may be detected by means of the so-called astigmatic method which is described, for example, in United

States Patent No. 4,358,200 (PHN 9597). The gratings may be conventional gratings or holographic gratings or holograms.

Claims

1. A scanning device for scanning an information plane (11) in an optical record carrier (10) by means of optical radiation, which scanning device comprises a radiation source (40) for supplying a scanning beam (20) and a mirror objective for focussing the scanning beam to a scanning spot (21) in the information plane, whereby the mirror objective comprises a first radiation window (31) which is centrally located around the optical axis of the mirror objective, a first reflector (33) arranged around the first radiation window, a second reflector (32) which is centrally located around the optical axis, and a second radiation window (34) located around the second reflector, the scanning beam from the source entering the mirror objective via the first radiation window, reversing its direction successively on the second reflector and on the first reflector and finally leaving the mirror objective through the second radiation window towards the record carrier, characterized in that the mirror objective comprises a transparant body (30) which is bounded by a first surface on a side facing the radiation source and by a second surface turned away from the radiation source, whereby the first radiation window and the first reflector are located on the first surface and the second radiation window and the second reflector are located on the second surface, the first and second reflector being reflective on the inside of the transparant body.

2. A scanning device as claimed in Claim 1, characterized in that the first reflector (33) is curved aspherically.

3. A scanning device as claimed in Claim 1, characterized in that the first and second reflectors (32, 33) are curved spherically.

4. A scanning device as claimed in Claim 3, characterized in that the second radiation window (34) is also curved spherically.

5. A scanning device as claimed in Claim 1, 2, 3 or 4, characterized in that the transparant body (30) comprises at least two portions (36, 37) which are manufactured from materials having different refractive indices.

6. A scanning device as claimed in Claim 1, 2, 3, 4 or 5 for scanning a reflective information plane (11) in which the scanning device includes a radiation-sensitive detector system (60), characterized in that the mirror objective comprises a beam-splitting element for spatially separating the beam emitted by the radiation source and the beam reflected from the information plane.

7. A scanning device as claimed in Claim 6, characterized in that the beam-splitting element comprises a grating or a hologram (38, 39).

8. A scanning device as claimed in Claim 7, characterized in that the grating or hologram is a reflection grating or a reflection hologram (35) provided on the second reflector (32).

9. A scanning device as claimed in Claim 7, characterized in that the grating or hologram is a transmission grating or a transmission hologram (39) provided on the first radiation window (31).

10. A scanning device as claimed in Claim 7, characterized in that the transparant body (30) of the mirror objective comprises two interconnected portions (36, 37) and in that the grating or hologram is a transmission grating or a transmission hologram (38) provided on one of the two portions on a side facing the other portion.

11. A scanning device as claimed in Claim 7, 8, 9 or 10, characterized in that the grating or hologram comprises at least two sub-gratings having different grating parameters.

12. A scanning device as claimed in Claim 7, 8, 9 or 10, characterized in that the grating or hologram has a constant or linearly varying grating period.

13. A scanning device as claimed in any one of the preceding Claims, characterized in that the radiation source is optically connected to the first radiation window.

14. A scanning device as claimed in any one of the preceding Claims, which is provided with a radiation sensitive detection system (60), characterized in that the radiation-sensitive detection system is arranged on the first radiation window (31) in the radiation path of radiation which has been reflected from the information plane (11) and which has traversed the mirror objective.

States Patent No. 4,358,200 (PHN 9597). The gratings may be conventional gratings or holographic gratings or holograms.

Claims

1. A scanning device for scanning an information plane (11) in an optical record carrier (10) by means of optical radiation, which scanning device comprises a radiation source (40) for supplying a scanning beam (20) and a mirror objective for focussing the scanning beam to a scanning spot (21) in the information plane, whereby the mirror objective comprises a first radiation window (31) which is centrally located around the optical axis of the mirror objective, a first reflector (33) arranged around the first radiation window, a second reflector (32) which is centrally located around the optical axis, and a second radiation window (34) located around the second reflector, the scanning beam from the source entering the mirror objective via the first radiation window, reversing its direction successively on the second reflector and on the first reflector and finally leaving the mirror objective through the second radiation window towards the record carrier, characterized in that the mirror objective comprises a transparant body (30) which is bounded by a first surface on a side facing the radiation source and by a second surface turned away from the radiation source, whereby the first radiation window and the first reflector are located on the first surface and the second radiation window and the second reflector are located on the second surface, the first and second reflector being reflective on the inside of the transparant body.

2. A scanning device as claimed in Claim 1, characterized in that the first reflector (33) is curved aspherically.

3. A scanning device as claimed in Claim 1, characterized in that the first and second reflectors (32, 33) are curved spherically.

4. A scanning device as claimed in Claim 3, characterized in that the second radiation window (34) is also curved spherically.

5. A scanning device as claimed in Claim 1, 2, 3 or 4, characterized in that the transparant body (30) comprises at least two portions (36, 37) which are manufactured from materials having different refractive indices.

6. A scanning device as claimed in Claim 1, 2, 3, 4 or 5 for scanning a reflective information plane (11) in which the scanning device includes a radiation-sensitive detector system (60), characterized in that the mirror objective comprises a beam-splitting element for spatially separating the beam emitted by the radiation source and the beam reflected from the information plane.

7. A scanning device as claimed in Claim 6, characterized in that the beam-splitting element comprises a grating or a hologram (38, 39).

8. A scanning device as claimed in Claim 7, characterized in that the grating or hologram is a reflection grating or a reflection hologram (35) provided on the second reflector (32).

9. A scanning device as claimed in Claim 7, characterized in that the grating or hologram is a transmission grating or a transmission hologram (39) provided on the first radiation window (31).

10. A scanning device as claimed in Claim 7, characterized in that the transparant body (30) of the mirror objective comprises two interconnected portions (36, 37) and in that the grating or hologram is a transmission grating or a transmission hologram (38) provided on one of the two portions on a side facing the other portion.

11. A scanning device as claimed in Claim 7, 8, 9 or 10, characterized in that the grating or hologram comprises at least two sub-gratings having different grating parameters.

12. A scanning device as claimed in Claim 7, 8, 9 or 10, characterized in that the grating or hologram has a constant or linearly varying grating period.

13. A scanning device as claimed in any one of the preceding Claims, characterized in that the radiation source is optically connected to the first radiation window.

14. A scanning device as claimed in any one of the preceding Claims, which is provided with a radiation sensitive detection system (60), characterized in that the radiation-sensitive detection system is arranged on the first radiation window (31) in the radiation path of radiation which has been reflected from the information plane (11) and which has traversed the mirror objective.

15. Use of a transparant body (30), comprising a first radiation window (31), a second radiation window (34), a first reflector (33) and a second reflector (32), in the mirror objective in the scanning device as claimed in any one of the preceding Claims.

16. An optical record and/or reproducing apparatus provided with a scanning device as claimed in any one of Claims 1 to 14.

Revendications

1. Dispositif de balayage pour le balayage d'une face d'information (11) dans un support d'enregistrement optique (10) à l'aide de rayonnement optique, lequel dispositif de balayage est muni d'une source de rayonnement (40) pour délivrer un faisceau de balayage (20) et d'un objectif à miroirs pour la focalisation du faisceau de balayage en un spot de balayage (21) dans la face d'information, l'objectif à miroirs comportant une première fenêtre de rayonnement (31) qui est située de façon centrale autour de l'axe optique de l'objectif à miroirs, un premier réflecteur (33) disposé autour de la première fenêtre de rayonnement, un deuxième réflecteur (32) qui est situé de façon centrale autour de l'axe optique et une deuxième fenêtre de rayonnement (34) située autour du deuxième réflecteur, le faisceau de balayage provenant de la source entrant dans l'objectif à miroirs par l'intermédiaire de la première fenêtre de rayonnement pour inverser sa direction successivement sur le deuxième réflecteur et sur le premier réflecteur et quitter finalement l'objectif à miroirs à travers la deuxième fenêtre de rayonnement vers le support d'enregistrement, caractérisé en ce que l'objectif à miroirs comporte un corps transparent (30) qui est limité par une première surface sur une face située vis-à-vis de la source de rayonnement et par une deuxième surface s'éloignant de la source de rayonnement, la première fenêtre de rayonnement et le premier réflecteur sont situés sur la première surface et la deuxième fenêtre de rayonnement et le deuxième réflecteur sont situés sur la deuxième surface, les premier et deuxième réflecteurs étant réflecteurs sur la face intérieure du corps transparent.

2. Dispositif de balayage selon la revendication 1, caractérisé en ce que le premier réflecteur 33 est courbé asphériquement.

3. Dispositif de balayage selon la revendication 1, caractérisé en ce que les premier et deuxième réflecteurs (32, 33) sont courbés sphériquement.

4. Dispositif de balayage selon la revendication 3, caractérisé en ce que la deuxième fenêtre de rayonnement (34) est également courbée sphériquement.

5. Dispositif de balayage selon la revendication 1, 2, 3 ou 4, caractérisé en ce que le corps transparent (30) comporte au moins deux parties (36, 37) qui sont réalisées en matériaux présentant des indices de réfaction différents.

6. Dispositif de balayage selon la revendication 1, 2, 3, 4 ou 5 pour le balayage d'une face d'information réflectrice (11) muni d'un système de détection sensible à rayonnement (60), caractérisé en ce que l'objectif à miroirs comporte un élément diviseur de faisceau pour la séparation spatiale du faisceau émis par la source de rayonnement et le faisceau réfléchi par la face d'information.

7. Dispositif de balayage selon la revendication 6, caractérisé en ce que l'élément diviseur de faisceau comporte une trame ou un hologramme (38, 39).

8. Dispositif de balayage selon la revendication 7, caractérisé en ce que la trame ou l'hologramme est une trame réflectrice ou un hologramme réflecteur (35) disposé(e) sur le deuxième réflecteur (32).

9. Dispositif de balayage selon la revendication 7, caractérisé en ce que la trame ou l'hologramme est une trame de transmission ou un hologramme de transmission (39) disposé(e) sur la première fenêtre de rayonnement (31).

10. Dispositif de balayage selon la revendication 7, caractérisé en ce que le corps transparent (30) de l'objectif à miroirs comporte deux parties interconnectées (36, 37) et en ce que la trame ou l'hologramme est une trame de transmission ou un hologramme de transmission (38) disposé(e) sur l'une des deux parties sur une face située vis-à-vis de l'autre partie.

11. Dispositif de balayage selon les revendications 7, 8, 9 ou 10, caractérisé en ce que la trame ou l'hologramme comporte au moins deux trames partielles présentant des paramètres de trame différents.

12. Dispositif de balayage selon les revendications 7, 8, 9 ou 10, caractérisé en ce que la trame

ou l'hologramme présente une période de trame constante ou variant linéairement.

13. Dispositif de balayage selon l'une des revendications précédentes, caractérisé en ce que la source de rayonnement est connectée optiquement à la première fenêtre de rayonnement.

14. Dispositif de balayage selon l'une des revendications précédentes, qui est muni d'un système de détection sensible à rayonnement (60), caractérisé en ce que le système de détection sensible à rayonnement est disposé sur la première fenêtre de rayonnement (31) dans le trajet de rayonnement du rayonnement réfléchi par la face d'information et qui a traversé l'objectif à miroirs.

15. Corps transparent (30) comportant une première fenêtre de rayonnement (31), une deuxième fenêtre de rayonnement (34), un premier réflecteur (33) et un deuxième réflecteur (32), approprié à être utilisé comme objectif à miroirs dans un dispositif de balayage selon l'une des revendications précédentes.

16. Appareil d'enregistrement et/ou d'enregistrement optique muni d'un dispositif de balayage selon l'une des revendications 1 à 14.

Patentansprüche

1. Abtastvorrichtung zum Abtasten einer Informationsfläche (11) in einem optischen Aufzeichnungsträger (10) mittels optischer Strahlung, wobei die Abtastvorrichtung eine Strahlungsquelle (40) zur Liefetung eines Abtaststrahls (20) sowie ein Spiegelobjektiv zum Fokussieren des Abtaststrahls zu einem Abtastfleck (21) in der Informationsfläche enthält, wobei das Spiegelobjektiv ein erstes Strahlungsfenster (31) besitzt, das um die optische Achse des Spiegelobjektivs zentral angeordnet ist, einen ersten um das erste Strahlungsfenster angeordneten Reflektor (33), einen zweiten um die optische Achse zentral angeordneten Reflektor (32) und ein zweites um den zweiten Reflektor angeordnetes Strahlungsfenster (34) enthält, wobei das Abtastbündel aus der Quelle durch das erste Strahlungsfenster hindurch in das Spiegelobjektiv eintritt, wobei seine Richtung aufeinandefolgend am zweiten Reflektor und am ersten Reflektor umgekehrt wird und das Bündel schließlich das Spiegelobjektiv durch das zweite Strahlungsfenster zum Autzeichnungsträger verläßt, dadurch gekennzeichnet, daß das Spiegelobjektiv einen durchsichtigen Körper (30) enthält, der von einer ersten Oberfläche an einer der Strahlungsquelle zugewandten Seite und von einer zweiten Oberfläche an einer von der Strahlungsquelle abgewandten Seite begrenzt ist, wobei das erste Strahlungsfenster und der erste Reflektor auf der ersten Oberfläche und das zweite Strahlungsfenster und der zweite Reflektor auf der zweiten Oberfläche angebracht sind, wobei der erste und der zweite Reflektor an der Innenseite des durchsichtigen Körpers reflektieren.

2. Abtastvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der erste Reflektor (33) asphärisch gekrümmt ist.

3. Abtastvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der erste und der zweite Reflektor (32, 33) sphärisch gekrümmt sind.

4. Abtastvorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß das zweite Strahlungsfenster (34) sphärisch gekrümmt ist.

5. Abtastvorrichtung nach Anspruch 1, 2, 3 oder 4, dadurch gekennzeichnet, daß der durchsichtige Körper (30) wenigstens zwei Teile (36, 37) enthält, die aus Werkstoffen mit verschiedenen Brechungsindizes hergestellt sind.

6. Abtastvorrichtung nach Anspruch 1, 2, 3, 4 oder 5 zum Abtasten einer reflektierenden Informationsfläche (11), wobei die Abtastvorrichtung mit einem strahlungsempfindlichen Detektorsystem (60) versehen ist, dadurch gekennzeichnet, daß das Spiegelobjektiv mit einem strahlaufspaltenden Element zum räumlichen Spalten des von der Strahlungsquelle ausgesandten Strahls und des von der Informationsfläche reflektierten Strahls versehen ist.

7. Abtastvorrichtung nach Anspruch 6, dadurch gekennzeichnet, daß das strahlaufspaltende Element ein Raster oder ein Hologramm enthält.

8. Abtastvorrichtung nach Anspruch 7, dadurch gekennzeichnet, daß das Raster oder Hologramm ein Reflexionsraster oder Reflexionshologramm (35) ist, das auf dem zweiten Reflektor (32) angebracht ist.

9. Abtastvorrichtung nach Anspruch 7, dadurch gekennzeichnet, daß das Raster oder Hologramm ein Transmissionsraster oder ein Transmissionshologramm (39) ist, das auf dem ersten Strahlungsfenster (31) angebracht ist.

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10. Abtastvorrichtung nach Anspruch 7, dadurch gekennzeichnet, daß der durchsichtige Körper (30) des Spiegelobjektivs zwei miteinander verbundene Teile (36, 37) enthält, und daß das Raster oder Hologramm ein Transmissionsraster oder ein Transmissionshologramm (38) ist, das auf einem der beiden Teile auf einer dem anderen Teil zugewandten Seite angebracht ist.

11. Abtastvorrichtung nach Anspruch 7, 8, 9 oder 10, dadurch gekennzeichnet, daß das Raster oder das Hologramm wenigstens zwei Teilraster enthält, wobei die Teilraster verschiedene Rasterparameter haben.

12. Abtastvorrichtung nach Anspruch 7, 8, 9 oder 10, dadurch gekennzeichnet, daß das Raster oder Hologramm eine konstante oder linear verlaufende Rasterperiode hat.

13. Abtastvorrichtung nach einem oder mehreren der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die Strahlungsquelle mit dem ersten Strahlungsfenster optisch verbunden ist.

14. Abtastvorrichtung nach einem der vorangehenden Ansprüche, wobei sie mit einem strahlungsempfindlichen Detektorsystem (60) versehen ist, dadurch gekennzeichnet, daß das strahlungsempfindliche Detektorsystem auf dem ersten Strahlungsfenster (31) im Strahlungsweg der von der Informationsfläche (11) reflektierten und das Spiegelobjektiv durchquerten Strahlung angebracht ist.

15. Durchsichtiger Körper (30) mit einem ersten Strahlungsfenster (31), einem zweiten Strahlungsfenster (34), einem ersten Reflektor (33) und einem zweiten Reflektor (32), welcher Körper zur Verwendung als Spiegelobjektiv in der Abtastvorrichtung nach einem der vorangehenden Ansprüche geeignet ist.

16. Optisches Aufzeichnungs- und/oder Wiedergabegerät mit einer Abtastvorrichtung nach einem oder mehreren der Ansprüche 1 bis 14.