The invention relates to an optical recording and/or reproduction apparatus having a recording and/or scanning device which is equipped with a lens wherein means or measures are provided which keep the surface of the lens dust free to a large extent and wherein the information carrier, a rotating disc, rests on a turn-table which is driven by a motor.

In the operation of apparatus of this type, especially CD players, it has been shown that dust deposited on the surface of the lens of the scanning systems can lead to a considerable reduction of the scanning quality. This manifests itself for example by a poor reproduction of music.

In addition, in record players for analogue gramophone records using mechanical scanning of a sound groove by means of a stylus, the collection of dust thereon impairs the reproduction. Consequently, in a pick-up system from the Company Shure Brothers, Type VR15, a small brush was arranged in the pick-up system in such a way that a number of adjacent grooves were brushed free of dust ahead of the stylus.

A solution was also known in which the pick-up passed a small brush on its way from and/or to the tone arm rest whereby dust was swept off the stylus. The manufacturer was the Company ELAC, Kiel.

A device for blowing away and/or sucking up small particles during the recording process of discs in accordance with the TED (tele-dialogue) method from AEG Telefunken was likewise known.

An optical recording and reproduction apparatus which is equipped with a scanning device, a lens and a device that covers the lens in a dust protective manner in the end position of the scanning device is known from the JP-A-63 255839.

An optical recording and reproduction apparatus whose scanning device is protected from dust in the rest position by a dust cover is described in the JP-A-61 224151.

An optical recording and reproduction apparatus having an object lens and an optical scanning device is known from the JP-A-61 280043.

In order to be cleaned, the object lens of the optical scanning device is moved out of the reading zone under a brushlike cleaning device. The object lens is moved backwards and forwards under the cleaning device in order to brush dust from its surface. At the end of the cleaning process, the object lens

remains in the rest position under the brushlike cleaning device so that it is protected from dust.

A reproduction apparatus which scans a disc capacitively by means of an electrode is known from the JP-A-59 065954.

The surface of the electrode is cleaned by a rotating brush. In addition, the arm upon which the electrode is located, is vibrated in order to intensify the cleaning effect.

An optical recording and reproduction apparatus having an object lens and an optical scanning device is known from the JP-A-63 136371.

A brush, which brushes the dust from the object lens, is located on the surface of a cleaning disc.

An optical recording and reproduction apparatus having an object lens, an optical scanning device and a cleaning disc is likewise known from the JP-A-63 273226.

The underlying object of the invention is to reduce or to remove interfering dust particle deposits on the surface of the lens of the optical system.

This object is achieved in accordance with the invention according to claim 1. Further details and developments of the invention can be gathered from the remaining claims.

According to the invention, the deposition of dust on the surface of the lens of the optical scanning device can be reduced or prevented by suitable means.

Two embodiments of the invention will be explained hereinafter with the help of the drawing. Therein

Figure 1 shows in a top view, in very simplified form, a lens cover which is mechanical actuated by the recording and/or scanning device

Figure 2 shows in a top view, the basic principle of a blowing device wherein an air stream is directed over the surface of a lens.

Figure 1 shows a mechanical device which is actuated by the recording and/or scanning device 3 when this is moved into its rest or end position close to the turn-table 2. In addition, the recording and/or scanning device 3 is depicted in a position

within its working range wherein the lens 4 is released in that the rotatably movable cover 5 tilts under the influence of the tension spring 8, in a counter clockwise sense, up to the stop 7 of an arm 9 of the cover 5. If the recording and/or scanning device 3 is moved by its radial drive means into the rest position, the cover 5 tilts in a clockwise sense into the position shown wherein the cover 5 covers the lens 4 and thus protects it from dust. This rotation is effected against the force of the tension spring 8 as soon as the recording and/or scanning device 3 pushes a second arm 10 of the cover 5 against a stop 6 attached to the chassis or the base plate 1. The part having the arms 9 and 10 is rigidly connected to the cover 5 and is rotatable about the axis 11. As opposed to the actual device, the illustration is shown approximately twice magnified.

In its approximately normal size, a device is shown in Figure 2 with which there is produced a directed air stream over the lens surface. In the illustration, one should imagine a transparent CD disc 20 and likewise the turn-table 21 located therebelow which has curved ribs 28 on its lower surface. During the rapid rotation of the turn-table 21, these produce an air stream in the direction of rotation indicated, arrow 26, which is directed by the deflecting part 27 over the surface of the lens 23 on the upper side of the recording and/or scanning device 24. The oppositely directed arrows 25 are intended to indicate the radial direction of movement of the recording and/or scanning device 24 during the play-mode. The radially directed double arrow 22 is intended to indicate the probe region.

Claims

1. Optical recording and/or reproduction apparatus having a recording and/or scanning device which is equipped with a lens wherein means or measures are provided which keep the surface of the lens dust free to a large extent and wherein the information carrier, a rotating disc (20), rests on a turn-table (21) which is driven by a motor, characterised in that, the one side of the disc (21) which does not serve for the placement of the disc (20), is provided with ribs (28) so that an air stream is produced which is guided over the surface of the lens by guide means (27).

2. Optical recording and/or reproduction apparatus in accordance with Claim 1, characterised in that, a mechanical device, which is actuated by the recording and/or scanning device (3) when this reaches its rest or end position or its standby position, is so constructed that it covers the lens (4) in this position in a dust-protecting manner.

3. Optical recording and/or reproduction apparatus in accordance with Claim 2, characterised in that, the mechanical device consists of a multi-armed lever whose one arm (10) has a stop (6) for actuation by the optical recording and/or scanning device (3) and whose other arm (9) has a cover (5) for the lens (4), that a return means (8) on the lever ensures that the lever releases the optical recording and/or scanning device (3) from the rest position upon starting of the apparatus.

4. Optical recording and/or reproduction apparatus in accordance with Claim 1, characterised in that, a fixed lens cover is so placed that the recording and/or scanning device is controlled into a standby position when the apparatus is switched off, and likewise for pauses, and/or is controlled into such a rest position or standby position during the repetition of scanning processes, that the lens cover (5) covers the lens (4).

5. Optical recording and/or reproduction apparatus in accordance with Claim 4, characterised in that, the lens cover (5) is provided, on its side facing the lens (4), with a layer or coating suitable for the removal of dust.

6. Optical recording and/or reproduction apparatus in accordance with Claim 1, 2, 3, 4 or 5, characterised in that, the lens cover (5) can be soaked with a cleaning fluid via a supply device.

7. Optical recording and/or reproduction apparatus in accordance with Claim 6, characterised in that, a closable opening for refilling the cleaning fluid is provided on the outer surface of the apparatus.

8. Optical recording and/or reproduction apparatus in accordance with Claim 1, 2, 3, 4, 5, 6 or 7, characterised in that, the lens (4) of the recording and/or reproduction device is vibrated.

9. Optical recording and/or reproduction apparatus having a focusing and/or tracking control loop in accordance with Claim 8, characterised in that, the coarse and/or fine drive means of the tracking control loop vibrates the lens (4).

10. Optical recording and/or reproduction apparatus in accordance with Claim 8 or 9, characterised in that, the adjusting member of the focusing control loop vibrates the lens (4).

11. Optical recording and/or reproduction apparatus in accordance with Claim 9 and 10, characterised in that, the vibration frequency in the radial direction differs from that in the focusing direction.

12. Optical recording and/or reproduction apparatus in accordance with Claim 11, characterised in that, the vibration frequency in the radial direction is selected to be higher than that in the focusing direction.

13. Optical recording and/or reproduction apparatus in accordance with Claim 4 or 5, characterised in that, the lens cover or its superimposed layer is constructed to be exchangeable for the purpose of replacement.

14. Optical recording and/or reproduction apparatus in accordance with one or more of the preceding Claims, characterised in that, it is ensured, by controlling the recording and/or scanning device, that the cleaning of the lens (4) is also carried out upon control operations by the user such as switching-off, standby, repeat and pause before and/or after the active phases of the recording and/or scanning device (3).

15. Optical recording and/or reproduction apparatus in accordance with one or more of the preceding Claims, characterised in that, in the event of an accidental withdrawal of the mains plug or of a power failure, an energy storage means delivers the energy necessary for the control of the cleaning.

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16. Optical recording and/or reproduction apparatus in accordance with one or more of the preceding Claims, characterised in that, upon switching the apparatus off, a timing member ensures that the recording and/or scanning device (3) reaches the rest and cleaning position before the switching off of the mains voltage becomes effective.