CLAIMS

1. (Amended) An optical head comprising

a holder member for retaining an optical means having the function of an objective lens focusing a laser beam to irradiate an optical recording medium including an electrically conductive material and an optical means having the function of a solid immersion lens disposed between the objective lens and the optical recording medium while keeping a fixed distance between the objective lens and the solid immersion lens, and

a moving mechanism for moving the holder member in a direction along an optical axis of the laser beam, wherein

an electrically conductive material is used on a surface of the optical head facing the optical recording medium.

2. The optical head according to claim 1, wherein a surface of the solid immersion lens facing the optical recording medium protrudes at its central portion and a surface at its peripheral portion is made flat, and a film made of the electrically conductive material is formed on the peripheral portion.



3. The optical head according to claim 2, wherein an electrically conductive material is used in the holder member, and the film formed on the peripheral portion is electrically

connected to the holder member.

4. The optical head according to any one of claim 1 to 3, wherein the numerical aperture of a lens group consisting of the objective lens and the solid immersion lens exceeds 1.

5. (Amended) A driving apparatus for an optical recording medium for driving the optical recording medium, including an electrically conductive material to perform either of the recording of information into the optical recording medium and the reproduction of information from the optical recording medium, comprising

an optical head including a holder member for retaining an optical means having the function of an objective lens focusing a laser beam to irradiate the optical recording medium and an optical means having the function of a solid immersion lens disposed between the objective lens and the optical recording medium while keeping a fixed distance between the objective lens and the solid immersion lens, and a moving mechanism for moving the holder member in a direction along an optical axis of the laser beam, in which an electrically conductive material is used on a surface of the optical head facing the optical recording medium, and

a signal processing means that produces, according to the electrostatic capacity formed by the electrically conductive

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material and the optical recording medium, a control signal for controlling the distance between the solid immersion lens and the optical recording medium as measured in the optical-axial direction, wherein

the holder member is moved by the moving mechanism according to the control signal.

6. The driving apparatus for an optical recording medium according to claim 5, wherein the signal processing means includes a means for generating a signal whose frequency or phase changes in accordance with a change in the electrostatic capacity, a means for generating a predetermined reference signal, and a means for producing the control signal by comparing either of the frequency and phase of the signal with that of the reference signal.

7. The driving apparatus for an optical recording medium according to claim 5 or 6, wherein

the numerical aperture of a lens group consisting of the objective lens and the solid immersion lens exceeds 1, and

the signal processing means produces a signal for controlling the distance to fall within 100 nm.



8. (Added) A method of controlling an air gap between an optical recording medium and a solid immersion lens in an

optical head, in which an optical means having the function of the solid immersion lens is disposed between the optical recording medium including an electrically conductive material and an optical means having the function of an objective lens focusing a laser beam to irradiate the optical recording medium, comprising the step of

providing the optical head in which the objective lens and the solid immersion lens are integrally retained by one holder member; and an electrically conductive material is used on a surface of the optical head facing the optical recording medium,

generating a control signal for controlling the distance between the solid immersion lens and the optical recording medium as measured in a direction along an optical axis of the laser beam according to an electrostatic capacity formed by the electrically conductive material and the optical recording medium, and

moving the holder member in the optical-axial direction according to the control signal.



EXPLANATION PURSUANT TO ARTICLE 19 (1) OF THE TREATY

(1) Explanation of Amendment

In a written amendment under the provision of Article 19 of PCT, with respect to claims 1 and 5, an amendment is made through changing the descriptions of their contents from " optical recording medium" to "optical recording medium including an electrically conductive material".

Also, in this written amendment, an amendment is made to add, as claim 8, a method of controlling the air gap between the optical recording medium and the SIL (Solid Immersion Lens) that is realized through the operation of the driving apparatus stated in claim 5.

That the optical recording medium includes an electrically conductive material is described after the fashion of "the aluminum-made reflection surface of the optical disc 51" on the 14th and 15th lines in the specification of this application.

Regarding the method of controlling the air gap in claim 8 as well, the relevant description is made from the page 9, line 22 to the page 13, line 24 in the specification of this application.

Accordingly, these amendments satisfy the requirements provided in Article 19 (2) of PCT.

(2) Relation to the Literatures Enumerated in the International Investigation Report

The invention of this application provides an optical head in which an objective lens and a SIL lens are integrally retained by one holder member; and an electrically conductive material is used on a surface of the optical head facing the optical recording medium. This holder member is moved according to an electrostatic capacity formed between the electrically conductive base material and the optical recording medium. By arranging the invention like this, the control of the air gap between the optical recording medium and the SIL as well as the focus servo can simultaneously be performed with a single moving mechanism.

The invention of USP 5729393 of the literatures under the category "Y" listed in the International Investigation Report in connection with claims 1 and 5 is directed to controlling the air gap between the optical recording medium and the SIL not through the electrostatic capacity but through the floating of an air bearing slider.

The invention of JP 10-188333 is none the less directed to controlling the disc-to-SIL air gap not through an electrostatic capacity but through the floating of an air slider. In its 29th to 30th paragraphs, it is described that a voice coil actuator 130 performs the control (focus servo) of the position of a relay lens 15 according to the electrostatic

capacity. However, the SIL 17 and the relay lens 15 are separately retained by an air slider 16b and the voice coil actuator 130, respectively. And not on a surface facing a disc 19 but between the SIL 17 side and the relay lens 15 side are used electrically conductive materials (electrodes 61a and 61b). Therefore, this construction completely differs from that of the invention of this application, in which the objective lens and the SIL are integrally retained by a single holder member and the electrically conductive material is used on the surface facing the optical recording medium.

The invention of JP 6-267091, as illustrated in FIG. 1, is directed to detecting not the air gap between the optical recording medium and the SIL but the inclination of the optical disc 3 according to the electrostatic capacity.

The invention of JP 8-212579, as illustrated in FIGS. 1 and 3, is directed to separately retaining an objective lens 41 and a SIL 43 by holders 44 and 47, respectively, to perform the control of the air gap between a magneto-optical disc 1 and the SIL 43 with a SIL actuator 48 according to the electrostatic capacity between the holders 44 and 47. In addition thereto, this cited invention performs the control of the position of the objective lens 41 (focus servo) with a focus actuator 45 according to the output of a head 3. Accordingly, the construction of this cited invention completely differs from that of the invention of this application in that the objective

lens and the SIL are integrally retained by one holder member and also the electrically conductive material is used on the surface facing the optical recording medium.

Making such a construction as in the invention of this application when controlling the air gap between the optical recording medium and the SIL is neither described nor suggested at all in any one of these listed literatures.