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(54) Title: OPTICAL DATA STORAGE SYSTEM WITH MULTIPLE WRITE-ONCE PHASE-CHANGE RECORDING LAYERS

(57) Abstract

An optical disk drive (10) uses an optical disk (12) with spatially separated multiple phase-change WORM recording layers (51, 66). The optical disk has a light transmissive substrate onto which the laser light is incident. The substrate supports at least two spatially separated multi-film recording stacks (90, 92), each stack including an active recording layer of phase-change WORM material. The disk is either an air-gap (78) structure wherein each recording stack is supported on a separate substrate (50, 56) and the substrates (50, 56) are separated by an air-gap (78), or a solid structure wherein a solid light transmissive spacer layer (22) separates the recording stacks (90, 92). Each of the recording stacks (90, 92) located between the substrate (50) on which the laser light is incident and the farthest recording stack includes an active phase-change recording layer (51) and an optical interference film (53) in contact with the recording layer (51). The recording layer (51) is made sufficiently thin to have good light transmissivity, but at this low thickness, without any other layers, is not sufficiently reflective to act as a recording layer with suitable servo and recording performance. The optical interference film (53) in contact with the recording layer (51) has a high index of refraction relative to the adjacent recording layer (51) and spacer (122) to increase the optical interference effect in the recording stack (90). The optical interference film (53) optimizes the contrast, reflectivity and transmissivitzy of the recording stack. The optical interference film (53) has low absoprtion so that laser light can pass through it to focus on a farther recording layer (66). This allows the farther recording layers (66) to be written using reasonable laser power.

