it is possible to greatly suppress fluttering of the magnetic disk 1 when the magnetic disk 1 rotates at high speed. Thus, the above product F·D of the magnetic disk 1 according to the second embodiment is limited to 47.0 or less. That is, fluttering of the magnetic disk 1 when the magnetic disk 1 rotates at high speed can be greatly suppressed by setting the above product F·D to 47.0 or less. The flutter characteristic F depends on the materials and the thicknesses of the substrate 3 and the coating layer 5. Therefore, the magnetic disk 1 having a product F·D of 47.0 or less can be obtained by adjusting the materials and the thicknesses of the substrate 3 and the coating layer 5. The flutter characteristic F of the magnetic disk 1 having a diameter of 95 mm is preferably 80 nm or less. Because the magnetic disk 1 with a diameter of 95 mm or more is likely to flutter significantly, a small flutter characteristic F in this manner is effective in suppressing fluttering. From the viewpoint of further improving effects of suppressing fluttering of the magnetic disk 1 having a thickness of 0.51 mm or less, the product F·D is 45.0 or less, 43.0 or less, or 40.0 or less, preferably 35.0 or less, or 32.0 or less, and more preferably 30.0 or less, 24.0 or less, or 20.0 or less.

[0047] Because the magnetic disk 1 according to the second embodiment has a product F·D of 47.0 or less and a maximum amplitude of 0.25 mm or less when an impact test was carried out under the condition of 30 [G], it is possible to suppress the formation of particles in an HDD while suppressing fluttering.

[0048] (Third Embodiment)

A magnetic disk 1 according to a third embodiment is configured similarly to the magnetic disk 1 of the first embodiment, except that the above product F·D of the magnetic disk 1 of the third embodiment is 47.0 or less, and the thickness T of the coating layer 5, the thickness t of the substrate 3, and the thickness ratio T/t of the magnetic disk 1 of the third embodiment are in predetermined ranges, instead of the maximum amplitude of the magnetic disk 1 of the first embodiment in the impact test being within the above range.

[0049] Regarding the thickness of the magnetic disk 1 of the third embodiment in the thickness direction, the ratio T/t of the thickness T [mm] of each of the coating

the protecting layer is formed using C_2H_4 by a CVD (Chemical Vapor Deposition) process, and a nitriding treatment of introducing nitrogen to the surface is performed in the same chamber, and for example, PFPE (perfluoropolyether) is applied onto the protecting layer through dip coating, and thus a lubricating layer can be formed. The magnetic disk 1 can be produced in this manner.

[0057] In order to achieve further higher density recording with the magnetic disk 1, a magnetic recording layer preferably contains a magnetic material with high magnetic anisotropy energy. Magnetic materials preferable from this viewpoint can include Fe-Pt-based magnetic materials and Co-Pt-based magnetic materials. Note that, here, "-based" means inclusion. Namely, the magnetic disk 1 can have a magnetic recording layer containing Fe and Pt, or Co and Pt, as the magnetic recording layer. With respect to a magnetic recording layer containing these magnetic materials and to a film formation method thereof, descriptions in paragraph 0074 in WO 2011/019010A1, and Examples in this publication can be referred to. Furthermore, a magnetic disk 1 having such a magnetic recording layer is preferably applied to a magnetic recording apparatus by a recording system referred to as an energy-assisted magnetic recording system (EAMR). Among energy-assisted recording systems, a recording system in which magnetization reversal is assisted by irradiation with near-field light or the like is referred to as a heat-assisted magnetic recording system (HAMR), and a recording system in which magnetization reversal is assisted by microwaves is referred to as a microwave-assisted magnetic recording system (MAMR). With respect to details of these, paragraph 0075 in WO 2011/019010A1 can be referred to. Note that a conventional CoPtCr-based material may be used as a magnetic material for forming a magnetic recording layer.

[0058] The substrate 3 and the coating layers 5 of the magnetic disk 1 of the first embodiment are preferably made of materials according to which the magnetic disk 1 has a specific elastic modulus E/d of 40 or more and the maximum amplitude of the magnetic disk 1 when an impact test is carried out under the condition of 30 [G] is 0.25 mm or less.