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Formation of Sets and Subsets of Informative Features of Information Carriers with Magnetic Hard Disks*

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***Abstract**: On the basis of the informative features describing each one of the components of a single magnetic disk, new informative features are presented, which form a substantial subset of the informative features of a single magnetic disk. This subset is limited to the composition of the substrate material and the functional layers – a magnetic coating, anti-corrosion coating, protective coating and a lubricate layer.*

***Keywords**: magnetic hard disk, information carriers, informative features.*

Introduction

The informative feature is a characteristic for a given event, phenomenon or object which contains at least some minimal information. The number of features in a set describing (for example) one object is practically very large. That is why the purpose to form subsets with the smallest number of possible features, describing the subject well enough, is logical and reasonable. It is established that the subsets facilitate the evaluation and the selection of objects and improve their classification [1, 2].

Each informative feature contains a certain amount of information with a definite value. In case these criteria of the features, their quality and value are known, it is not difficult to arrange them with respect to the quality and value of the information they include.

Unfortunately, when the objects are not well known or treated from an informative point of view, the computing of the quality and the value of the attributes information is very difficult, sometimes even impossible. In this case specific methods are designed, sometimes applicable for a limited number of objects only [3-6].

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The information carriers on a magnetic hard disk for data storage are:

- alterable magnetic disk packages;
- alterable information modules “Winchester”;
- magnetic disk packages integrated in the chassis of the storage magnetic disk devices with hard magnetic disks.

The alterable magnetic disk packages represent in their essence one or more single magnetic disks with a hard substrate, connected in a package with the help of two flanges, a hub fixing the package on a spindle and a different number of hoops fixing the disks at equal distance.

The alterable information module “Winchester” comprises the blocks of the magnetic package and of the magnetic heads.

In the integrated storage magnetic disk devices with hard magnetic disks, all functional blocks are integrated in the device chassis.

Regardless of the type of the information carrier with hard magnetic disks, the main and most important active element in it is the single magnetic disk, on which magnetic coating is placed. The single magnetic disk is a hard substrate of aluminum alloy, glass or graphite, on which several functional layers are laid on (Fig. 1).

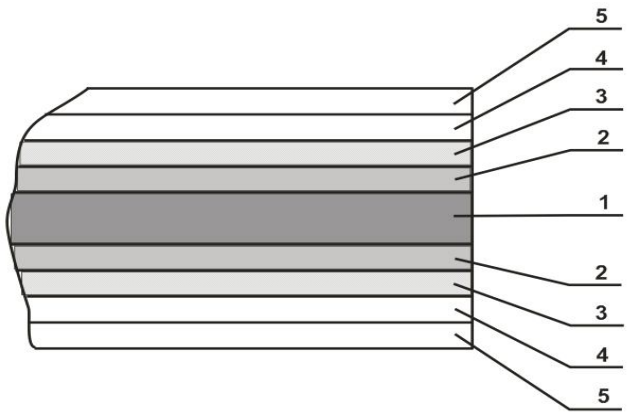

Fig. 1

Fig. 1 shows the Single Magnetic Disk (SMD) structure, with the following denotations: **1** – substrate material (S), **2** – Anti-Corrosion Coating (ACC), **3** – Magnetic Layer (ML), **4** – Protective Layer (PL), **5**– Lubricate Layer (LL)

The Anti-Corrosion Coating (ACC) is a chemical or galvanic covering that protects the substrate against corrosion and improves the adhesion of the magnetic coating to the substrate. The Protective Layer (PL) improves the flying of the magnetic heads above the magnetic disks and the wear resistance. The Lubricate Layer (LL) decreases the danger from mechanical damages for the period of flying off and landing of the heads during packages start and stop.

List of the informative features of the SMD

The most important informative features of the single magnetic hard disk for data storage can be described as:

1. Type of the Substrate (S),
2. Composition of the substrate material,
3. Linear expansion of S,
4. Weight of S,
5. SMD geometry,
6. External diameter D1 of the SMD,
7. Internal diameter D2 of the SMD,
8. Concentricity of the diameters,
9. SMD thickness,
10. Chamfer of the external diameter,
11. Chamfer of the internal diameter,
12. Anti-Corrosion Coating (ACC) of the substrate,
13. ACC composition,
14. ACC thickness,
15. Adhesion of the ACC to the substrate,
16. Adhesion of the ACC to the magnetic layer,
17. ACC resistance to atmosphere conditions,
18. Class of ACC roughness,
19. Wear resistance of ACC,
20. Type of the Magnetic Layer (ML),
21. ML thickness,
22. Coercive force of the ML,
23. Induction of saturation in ML,
24. Residual induction of the ML,
25. Rectangularity of ML hystheresis,
26. ML peak shift,
27. ML location,
28. ML composition,
29. Corrosion resistance of the ML,
30. Adhesion of the ML to the substrate,
31. ML wear resistance,
32. Class of ML roughness,
33. Type of the Protective Layer (PL) on the ML,
34. Composition of the PL,
35. PL thickness,
36. Adhesion of the PL towards the ML,
37. Wear resistance of the PL,
38. Corrosion resistance of the PL,
39. Type of the Lubricating Layer (LL) of SMD,
40. LL composition,
41. LL thickness,
42. LL static coefficient of friction,
43. LL dynamic coefficient of friction,

44. Wear resistance of the LL,
45. Inertia moment of SMD,
46. Radial beat of SMD,
47. Axial beat of SMD,
48. Speed of SMD axial beat,
49. Acceleration of SMD axial beat,
50. Stability of SMD at high revolutions,
51. Maximal linear recording density of SMD,
52. Maximal radial recording density of SMD,
53. Maximum number of tracks on one surface of the SMD,
54. Maximal areal density of SMD,
55. SMD capacity,
56. Amplitude of the signal read on the external working Diameter (Dr1),
57. Amplitude of the signal read on the internal working Diameter (Dr2),
58. Resolution on Dr1 of the SMD,
59. Resolution on Dr2 of the SMD,
60. Re-writing on Dr1 on SMD,
61. Re-writing on Dr2 on SMD,
62. Modulation of the signal of Dr1 on SMD,
63. Modulation of the signal of Dr2 on SMD,
64. Number of errors on one surface of SMD,
65. Number of errors on both surfaces of SMD,
66. Number of “missing bit” errors,
67. Number of “extra bit” errors,
68. Reliability,
69. SMD resistance to continuous functioning,
70. SMD resistance to vibration,
71. SMD resistance to strokes,
72. SMD resistance to large and sharp delays,
73. SMD resistance to multiple landing on and off of the magnetic heads,
74. Maximal working temperature of SMD,
75. Minimal working temperature of SMD,
76. Maximal relative humidity of SMD,
77. Maximal temperature of SMD transport,
78. Minimal temperature of SMD transport,
79. Maximal relative humidity of SMD transport,
80. Maximal temperature of SMD storing,
81. Minimal temperature of SMD storing,
82. Maximal relative humidity of SMD storing.

The limitation of the formation of informative features up to the Single Magnetic Disk (SMD), and not to the other parts of the magnetic package is due to considerations of technological character. These parts, no matter whether they are alterable magnetic packages, an information module “Winchester” or a magnetic package for an integrated storage device, possess one and the same purpose – to ensure a functional possibility for efficient application of the magnetic disks included in the respective magnetic package.

Every one of the 82 informative features entered contains information about the substrate and the functional layers put on it.

With regard to user's convenience and efficient advertising, it is appropriate to diminish this set components up to a reasonable number and to form a corresponding subset, which completely enough and unambiguously enables the description and the evaluation of the single magnetic disk and its assignment to a corresponding class of an information magnetic carrier on a hard substrate.

Formation of a subset of informative features for a single magnetic disk

One approach for this formation in conditions of a large set, is one of the methods described in [1-6] or a combination of them. If the informative features, which describe each one of the components of the single magnetic disk, shown in Fig. 1 and above mentioned, are used as a basis, some new informative features can be formed which denote a substantial subset of SMD informative features:

1) composition of the substrate material,
2) substrate geometry,
3) composition of the anti-corrosion coating ACC,
4) magnetic layer composition,
5) adhesion of the magnetic coating ACC to the protective layer PL,
6) adhesion to the protective layer PL,
7) composition of the protective layer,
8) composition of the lubricate layer LL.

Conclusion

New informative features that form a substantial subset of informative features for a single magnetic disk are suggested on the basis of the informative features describing each one of the single magnetic disk components. The restricting only to the composition of the substrate material and the functional layers – the magnetic coating, the anti-corrosion coating, the protective and lubricate layer is reasonable, since the composition contains enough information for the qualities and properties of the respective alloys.

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