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Bezeichnung der Erfindung: Magnetic recording medium
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : H01F

ENTSCHEIDUNG / DECISION
vom / of / du 20 February 1985

Anmelder / Applicant / Demandeur : Hitachi Maxell

~~Patentinhaber / Proprietor of the patent~~
~~Titulaire du brevet~~

~~Einsprechender / Opponent / Opposant~~

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Art.52(1),56
"Inventive Step"

Leitsatz / Headnote / Sommaire

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Case Number: T 111/82

DECISION

of the Technical Board of Appeal 3.5.1

of 20 February 1985

Appellant: Hitachi Maxell, Ltd.
No. 1-88, Ushitora 1-chome,
Ibaraki-shi,
Osaka-fu,
Japan

Representative: Alek von Kreisler
Deichmannhaus am Hauptbahnhof
5000 Köln 1

Decision under appeal: Decision of Examining Division 067 of the European Patent Office dated 29 March 1982 refusing European patent application No 791ß2693.3 pursuant to Article 97(1) EPC

Composition of the Board:

Chairman: G. Korsakoff
Member: J. van Voorthuizen
Member: P. Ford

Summary of Facts and Submissions

I. European Patent Application No. 79 102 693.3 filed on 28.07.79 (Publication No. 0 007 642) claiming a priority of 31.07.78 (JP), was refused by a decision of the Examining Division 067 of the EPO of 29.03.82. That decision was based on Claim 1 filed on 28.11.81 and Claims 2-10 filed on 20.11.80.

II. The reason given for the refusal was that the subject-matter of the claims lacked inventive step with regard to JP-A-4 9475/74, US-A-4 002 804, DE-A-2 647 941 and US-A-4 010 310.

III. The applicant lodged an appeal against this decision on 25.05.82. The Statement of Grounds was filed on 20.07.82. The appeal fee was paid on 25.05.82.

IV. In a communication of 10.11.83 the Rapporteur of the Board of Appeal drew the applicant's attention to some further documents viz. Journal de Physique, Tome 38, avril 1977, pages C1 337-340, GB-A-1 441 183 and US-A-2 941 901. He further set out a number of objections against the then valid claims which were identical to those on which the decision under appeal was based.

V. In his Statement of Grounds and in the reply of 10.03.84 to the aforesaid communication the applicant essentially argued as follows.

The disadvantage that Co-adsorbed ferric oxide materials have a high electrical resistance was for the first time found by the applicant and the finding that

a mixture of such particles with γ-ferric oxide particles results in superior magnetic properties constitutes inventive step. As regards US-A-4 010 310, the person skilled in the art would have concluded that the dispersibility of the particles disclosed therein would necessarily be a matter of the Co-concentration at the surface. In view of the heat treatment whereby Co-doped rather than Co-adsorbed particles are obtained he would thus have believed the Co-adsorbed material containing the same amount of Co to be still less dispersible than the Co-doped material. He would not have expected that mixing with ferric oxide would lead to excellent dispersibility and magnetic properties.

Applicant furthermore stressed the fact that although Co-adsorbed iron oxide and γ-ferric oxide are both known by themselves none of the cited documents shows their combination in a single layer and such combination was not obvious. The iron oxide particles used in US-A-2 941 901 are clearly different from those used in the present application.

VI. The applicant requested that a European patent be granted on the basis of claim 1 as filed on 28.11.81, dependent claim 2 as filed on 10.03.84 and the nine dependent claims filed on 20.11.80 renumbered as 3-11. These claims read as follows:

1. A magnetic recording medium which comprises as a recording element a mixture of cobalt-containing iron oxide magnetic particles and γ-ferric oxide particles, characterised by the ferromagnetic iron oxide particles having a cobalt content of 0.3 to 5% by weight based on the weight of the particles and containing

the cobalt predominantly in the outer region thereof, and by said cobalt-conntaining iron oxide magnetic particles and γ-ferric oxide particles being mixed in the ratio of 10 : 90 to 50 : 50 by weight.

2. A magnetic recording medium according to claim 1, wherein the cobalt-containing iron oxide magnetic particles and γ-ferric oxide particles are both acicular particles

3. A magnetic recording medium according to claim 1 wherein the cobalt-containing iron oxide magnetic particles have a coercive force of 1,592 to 7,958 A/M (20 to 100 oersteds) higher than the coercive force of the γ-ferric oxide particles.

4. A magnetic recording medium according to Claim 3 whereinthe cobalt-containing iron oxide magnetic particles have a coercive force of 2,387 to 6,366 A/M (30 to 80 oersteds) higher than the coercive force of the γ-ferric oxide particles.

5. A magnetic recording medium according to claim 1, wherein the cobalt-containing iron oxide magnetic particles and the γ-ferric oxide particles are mixed in the ratio of 25:75 to 50:50 by weight.

6. A magnetic recording medium according to claim 1, wherein the γ-ferric oxide particles have a coercive force of no more than 30,240 A/M (380 oersteds).

7. A magnetic recording medium accordng to claim 6 wherein the γ-ferric oxide particles have a coercive force of 25,465 to 29,444 A/M (320 to 370 oersteds).

8. A magnetic recording medium according to anyone of claims 1-7, wherein the surface layer of cobalt-containing iron oxide of the cobalt containing iron oxide magnetic particles contains divalent iron in addition to cobalt.

9. A magnetic recording medium according to claim 8, wherein the cobalt-containing iron oxide magnetic particles have a cobalt content of 0.3 to 1.8 % by weight and a divalent iron content of 0.1 to 8% by weight based on the weight of the cobalt-containing iron oxide magnetic particle and have a coercive force of 29,444 to 33,422 A/M (370 to 420 oersteds).

10. A magnetic recording medium according to claim 1, which has a coercive force of not more than 30,230 A/M (380 oersteds).

11. A magnetic recording medium according to claim 10, which has a coercive force of 27,056 to 30,239 A/M (340 to 380 oersteds)..

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is therefore admissible.

2. A magnetic recording material consisting of γ-ferric oxide containing cobalt predominantly in the outer region thereof (Co-adsorbed ferric oxide) and the advantages which are thereby obtained are known from several publications: JP-A-4 947 5/74; GB-A-1 441 183 and the article in Journal de Physique, Tome 38, avril

1977, pages C1-337 - 340. Cobalt percentages between 0,5 and 5 and between 0 and 6,5 by weight are disclosed in Figure 1 of the GB patent and Figure 2 of the article respectively.

3. US-A-4 010 310 teaches that high Co-percentages in Co-doped ferric oxide are to be avoided because causing dispersibility problems due to coagulation of the particles. It is suggested to keep this percentage relatively low, e.g. below 4,5% which corresponds almost exactly to the range stated in claim 1.

4. Whether the dispersibility problem could be expected to be aggravated in case the Co is adsorbed to the ferric oxide particles is not clear as the document gives no explanation for the coagulation which has been observed.

It is noted in this connection that GB-A-1 441 1883 mentions that magnetic tapes have been prepared using such a material (Example 3 on page 4) and apparently no dispersibility problems have been encountered during the preparation of these tapes. There was, therefore certainly no compelling reason for the person skilled in the art to believe that Co-adsorbed ferric oxide comprising Co in the disclosed ranges would give rise to particular difficulties so far as dispersibility was concerned.

In any case, however, the person skilled in the art could expect that dispersibility problems would be lessened by mixing the Co-adsorbed particles with more dispersible particles, such as γ-ferric oxide.

5. The fact that the magnetic material known from the references cited in paragraph 2 has an undesirably high electrical surface resistance, even if this was possibly not known at the priority date of the present application, cannot in itself be considered as surprising, as a high surface resistance is not uncommon for magnetic materials of the type used for recording purposes. The person skilled in the art when carrying out normal experimentation would inevitably have found that the electrical resistance of the Co-adsorbed material is higher than that of the untreated ferric oxide.

6. It has long been common practice to add a conductive anti static agent such as carbon black in order to avoid the undesired effects caused by the high resistance (see e.g. US-A-4 002 804, column 7, lines 33-34). The clear disadvantage of adding such a substance is, however that the magnetic and other properties of the recording material may be degraded. The man skilled in the art therefore, could be expected to look for other ways to avoid the problems caused by a high electrical resistance.

7. It has been proposed in US-A-2 941 901 to use in a single layer a mixture of Co-containing iron oxide which has a high coercive force but has at the same time an undesirable property (i.c. an insufficient stability) together with unmodified γ-Fe_2O_3 not having such undesirable property to obtain a recording medium which represents an acceptable compromise of the different properties. (cf. column 1, lines 52-58 and Example 5).

8. It is in view of the foregoing considered as obvious to the person skilled in the art to combine in a single layer Co-adsorbed iron oxide particles having a high remanence but at the same time a high electrical resistance with γ-ferric oxide particles having a lower remanence but also a lower electrical resistance to arrive at a recording material having values for these two properties which can be regarded as an acceptable compromise by which no unexpected result is obtained.

The fact that the Co-containing material according to US-A-2 941 901 is not identical with that used in the present application is not relevant to the foregoing considerations.

9. As also the mixing ratios defined in claim 1 do not provide any unexpected effects but appear to be merely the result of tests normally effected by a person skilled in the art to determine the range of usable ratios, this claim is considered to be unallowable for lack of inventive step.

10. The newly filed claim 2 specifies that the Co-containing particles and the ferric oxide particles are both acicular, in order "to delimitate the invention ... against the state of the art" as the applicant pretends. As, however, claim 1 is not amended the protection sought by the applicant is not limited by the addition of this dependent claim. Moreover the acicular form of the magnetic particles concerned is usual, as shown by the documents cited in para's 2 and 3 above. As Claim 2 does not add any inventive feature to Claim 1 it is likewise unallowable.

11. In the Rapporteur's communication of 10.11.83 reasoned objections to all the then valid dependent claims were presented. In his reply of 30.12.83 the applicant in essence contended that claim 1 involved inventive step and so the dependent claims had to be considered as allowable, without however refuting the objections made to these dependent claims. Under these circumstances the objections against these claims (now renumbered 3-11) are maintained and none of them is considered to comprise patentable subject matter.

Order

For these reasons it is decided that:

The appeal is dismissed.