BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

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File Number: T 29/91 - 3.5.2

Application No.: 84 108 671.3

Publication No.: 0 137 926

Title of invention: Magnetic recording medium

Classification: G11B 5/702

D E C I S I O N
of 16 June 1992

Proprietor of the patent: KABUSHIKI KAISHA TOSHIBA

Opponent: 01) Agfa-Gevaert AG, Leverkusen
02) BASF Aktiengesellschaft

Headword:

EPC Article 56

Keyword: Inventive step (no)

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number : T 29/91 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 16 June 1992

Party under Article 107 EPC : (Opponent 01)
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Decision under appeal :
Interlocutory decision of the Opposition Division of the European Patent Office dated 13 November 1990 concerning maintenance of European patent No. 0 137 926 in amended form.

Composition of the Board :

Chairman : R.E. Persson
Members : J.A.H. van Voorthuizen
W.J.L. Wheeler

Summary of Facts and Submissions

I. Following an opposition filed by Agfa-Gevaert AG (Opponent 01) and BASF AG (Opponent 02) European patent No. 0 137 926 was maintained in amended form.

The Opposition Division considered that the squareness ratio of a recording medium according to the contested patent had a high value which could not be expected from the combined teaching of the following documents:

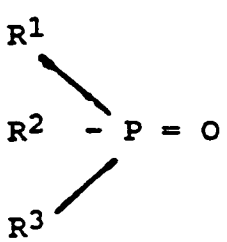
D1: JP-A-55/151 069 (English translation)
D5: JP-A-058 229/1982 (Derwent abstract Acc. No. 40 089 E/20).

II. As amended during the proceedings before the Opposition Division, the patent had five claims, Claim 1 being worded as follows:

"1. A magnetic recording medium which comprises magnetic particles consisting of hexagonal ferrite of the general formula

$$MO.m(Fe_{1-x}A_x)_2O_3$$

(wherein M represents any one of Ba, Sr, Pb and Ca; m represents a number of 5 to 6; A represents a transition metal selected from the group consisting of Ti, Co, Zn, In, Mn, Cu, Ge and Nb; and $0 \leq x \leq 0.2$); a phosphate represented by the formula:



Wherein R^1, R^2 and R^3 may be the same or different and each represents $R^4O-(-CH_2CH_2O-)-n$ (wherein R^4 is an alkyl group having 8 to 20 carbon atoms or an alkylphenyl group whose alkyl group moiety has 8 to 20 carbon atoms, and n is an integer of 2 to 10) or a group of HO-, with the proviso that at least one of R^1, R^2 and R^3 is a group of $R^4O-(-CH_2CH_2O-)-n$ (wherein R^4 and n are as defined above); a lecithin and a binder."

Dependent Claims 2 to 5 concerned specific embodiments of a magnetic recording medium according to Claim 1.

III. The Opponent 02 (Appellant) lodged an appeal against the interlocutory decision of the Opposition Division and referred in the Statement of Grounds of Appeal to the following new document:

D7: IEEE Transactions on Magnetics, Vol. MAG-13, No.5, September 1977, pages 1391 to 1393.

IV. In a letter of 13 September 1991 the Respondent requested to amend the definition of "x" in Claim 1 to read:

$$0 < x \leq 0.2$$

to exclude the value "0" from the range (main request).

V. In a communication dated 1 April 1992 the Board referred to a new document, namely

D8: IEEE Transactions on Magnetics, Vol. MAG-18, No. 6, November 1982, pages 1122 to 1124

to help clarify some controversial points made by the parties.

VI. In the course of oral proceedings, which were held on 16 June 1992, the Respondent submitted a new set of claims (auxiliary request).

Claim 1 according to the auxiliary request, which is based on Claims 1 and 2 decided upon by the Opposition Division, differs from Claim 1 according to the main request in that the hexagonal ferrite is defined as "having a mean particle size ranging from 0.01 to 0.3 μm and coercive force ranging from 15922 to 159225 A/m (200 to 2000 Oe)".

Claims 2 to 4 according to the auxiliary request are respectively equivalent to Claims 3 to 5 according to the main request.

VII. The Appellant argued essentially as follows:

It was known from D1 that lecithin and phosphate combined together as dispersing agent in a magnetic paint had a synergistic effect on the dispersibility of magnetic particles. In fact, according to D1, recording media obtained from a magnetic paint based on a combination of lecithin and phosphate had a better squareness ratio than magnetic media comprising only lecithin or phosphate as dispersing agent. Since a magnetic paint containing a hexagonal ferrite, such as barium ferrite, and a phosphate was known from D5, it would be obvious to a skilled person to arrive at a recording medium according to the patent in suit by combining the teaching of D1 and D5. Values of squareness ratio considerably higher than those disclosed in D1 would also be expected, since the examples referred to in D1 were based on γ- Fe_2O_3, whereas in the contested patent a hexagonal ferrite, such as barium ferrite, was preferred. As was well documented in the art (D7 and D8), a higher squareness ratio was typical for barium ferrite.

In particular D8 related to a hexagonal barium ferrite for perpendicular recording of the kind used in the examples referred to in the contested patent.

VIII. The Respondent's arguments can be summarised as follows:

The fact that it was known from D7 and D8 that barium ferrite particles could have a squareness ratio above 0.9 did not prove that the skilled person would expect to achieve such results by combining the teachings of D1 and D5. Although D1 disclosed that lecithin and phosphate increased the squareness ratio of a magnetic recording medium based on Co-coated γ- Fe_2O_3 particles, it was not implied that that result could be extended to other kinds of magnetic materials. D5 related to a recording medium comprising hexagonal barium ferrite and phosphate, but it ignored the possibility of adding lecithin to enhance the dispersibility of the magnetic particles. The squareness ratio of the barium ferrite particles considered in D7 was measured for longitudinal recording. That high value (0.95) was not comparable to the results reported in the contested patent, since the latter were obtained for perpendicular recording. D8 was concerned with hexagonal barium ferrite particles for perpendicular recording and, indeed, disclosed a squareness ratio of 0.94. However, that document clearly showed that barium ferrite had a stronger temperature dependence than Co-coated γ- Fe_2O_3. In view of D8 the skilled person would be prejudiced against replacing γ- Fe_2O_3 with barium ferrite and, consequently, he would not think of applying the teaching of D1 to a magnetic medium based on barium ferrite particles. Furthermore, the unexpected improvement in the squareness ratio of the recording magnetic media according to the patent in suit was the result of particular combinations of hexagonal ferrite particles, phosphate and lecithin which were in no way suggested by the prior art.

IX. In a letter of 20 March 1992 Opponent 01 as a party as of right under Article 107 EPC merely requested that the case be decided on the basis of the file. He did not take part in the oral proceedings.

X. The Appellant requests that the decision under appeal be set aside and the patent be revoked.

The Respondent requests that the patent be maintained as decided by the Opposition Division subject to the amendment proposed in the letter of 13 September 1991 (main request) or on the basis of Claims 1 to 4 as submitted during the oral proceedings (auxiliary request).

Reasons for the Decision

1. The appeal is admissible.

2. The patent in suit as amended relates to the problem of improving the dispersibility of hexagonal ferrite particles in a magnetic recording medium in order to increase their orientation rate and, as a consequence, the medium's squareness ratio.

3. The main question to be considered in the present case is whether the skilled person, in view of the teaching of the prior art, would find it obvious to try a recording medium falling within the scope of Claim 1 according to either the main request or the auxiliary request in the expectation of achieving high values of squareness ratio.

4. Main request

4.1 It is known in the art (D1) that some parameters of a magnetic medium, such as the squareness ratio, can be improved through the combined use of lecithin and phosphate as dispersing agent for the medium's magnetic particles. The comparative examples of D1 clearly show that magnetic media comprising phosphate ester and soybean lecithin have a better squareness ratio than those containing either one or the other. However, the magnetic materials considered in D1 do not fall under the definition given in Claim 1 of the patent in suit and the best squareness ratio (0.87) disclosed in D1 (table, page 6) is considerably lower than the best value reported in the patent (0.94).

D5 is concerned with a magnetic recording medium comprising a hexagonal ferrite in particular barium ferrite and a phosphate according to Claim 1 of the contested patent.

D8 discloses that hexagonal barium ferrite platelets for perpendicular recording can have a squareness ratio up to 0.94. In that document it is also pointed out that the squareness ratio is a function of the orientation capability of the particles and that by better dispersing the particles a higher squareness ratio can be achieved (D8, page 1123, column 2).

4.2 Although he did not contest that the barium ferrite particles disclosed in D8 had the same value of squareness ratio as the recording medium of the patent in suit, the Respondent maintained that D8 would actually lead the skilled person away from the patent. According to the Respondent, the skilled person, having realised from Figure 4 (D8) that barium ferrite showed a stronger

temperature dependence than Co-coated γ- Fe_2O_3, as far as magnetisation and coercivity were concerned, would not think of replacing such particles in the recording medium according to D1 with barium ferrite particles. Therefore, he would not arrive at the recording medium of the contested patent.

4.3 In the opinion of the Board the temperature dependence is just one of the parameters to be considered when choosing a suitable magnetic material. The orientation of its easy axis of magnetisation (normal to the plane of the hexagonal crystal) makes barium ferrite particularly suitable for perpendicular recording and this characteristic by far outweighs the disadvantage of a higher temperature dependence in perpendicular recording applications. Therefore, it is reasonable to assume that the skilled person starting from a magnetic medium known from D5 and wishing to improve its squareness ratio would find it obvious to rely on the teaching of D1. In view of D8, he would also expect to achieve a squareness ratio of 0.94.

4.4 The Respondent further submitted that Claim 1 related to particular kinds of phosphate and ferrite, as defined by means of the following parameters: "m", "x" (substitution rate of Fe in the ferrite), number of C-atoms of the alkyl or alkylphenyl groups and "n" (number of $-(-CH_2CH_2O-)-$ groups). According to the Respondent, the claimed combinations of such parameters, ultimately responsible for the improvement in squareness ratio, were not suggested in any of the prior art documents.

4.5 As to the parameters of the magnetic particles, the Board notes that the measurements reported in D8 were carried out for a Co and Ti substituted barium ferrite with "m" = 6. As clearly specified in D8, the substitution of Fe with Co and Ti serves only the purpose of adjusting the

coercive force and does not effect the squareness ratio (Figure 3). In Table 1 "typical particles" are said to have a coercivity of 900 Oe (obtainable through Co and Ti substitution) and a squareness ratio = 0.94.

As to "n" and the number of C-atoms, it is acknowledged that D1, in particular Example 2, merely refers to a polyoxyethylene alkyl ether phosphate and a polyoxyethylene alkyl aryl ether phosphate, without exactly defining their possible structure. D5, however, specifies a phosphate with an alkylphenyl group whose alkyl group moiety has a number of C-atoms (2 to 12) overlapping the claimed range (8 to 20) and whose "n" (3 to 9) is comprised within the range according to the patent in suit (2 to 10).

It is further noted that the ranges of C-atom numbers and "n" defined in Claim 1 are very broad. Moreover, the squareness ratio over the tested ranges does not appear to show an unpredictable behaviour (Figures 1 and 2 of the patent in suit): it increases sharply as the number of C-atoms and "n" approach the low end of the respective ranges, it remains fairly constant over the claimed intervals and then falls off. In the opinion of the Board, it would be within the capability of the average skilled person to find out among the possible kinds of phosphate covered by the definition given in D1 those which are most apt in combination with lecithin to enhance the squareness ratio of barium ferrite particles. In view of the values for the number of C-atoms and "n" given in D5 the ranges defined in Claim 1 cannot be regarded as surprising but rather as more or less to be expected.

5. Auxiliary request

5.1 Claim 1 according to the auxiliary request differs from Claim 1 according to the main request only in that the

ferrite particles are further defined through their mean particle size (0.01 to 0.3 µm) and coercivity (200 to 2000 Oe). In D8 (page 1124) barium ferrite particles suitable for perpendicular magnetic recording are said to have a diameter smaller than 0.1 µm and a coercivity between 400 and 4000 Oe so that there exists a considerable overlap between the claimed and the known ranges. In the opinion of the Board therefore, the combination of such features with the subject matter of Claim 1 according to the main request cannot be considered as showing any inventive merit.

6. Hence, neither Claim 1 according to the main request nor Claim 1 according to the auxiliary request complies with the requirements of Article 56 EPC; the patent must be revoked.

Order

For these reasons, it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

M. Kiehl E. Persson