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D E C I S I O N
of 17 March 1998

Case Number: T 0406/96 - 3.5.2

Application Number: 88301235.3

Publication Number: 0279613

IPC: G11B 5/704

Language of the proceedings: EN

Title of invention:

Magnetic recording tape comprising a support film having a high transverse direction modulus

Patentee:

Minnesota Mining and Manufacturing Company

Opponent:

Teijin Limited

Headword:

-

Relevant legal provisions:

EPC Art. 52(1), 54, 56, 123(2) and (3)

Keyword:

"Inventive step - yes, after amendment"

Decisions cited:

-

Catchword:

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Boards of Appeal

Chambres de recours

Case Number: T 0406/96 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 17 March 1998

Appellant:
(Opponent)

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Respondent:
(Proprietor of the patent)

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Decision under appeal:

Interlocutory decision of the Opposition Division
of the European Patent Office posted 14 March
1996 concerning maintenance of European patent
No. 0 279 613 in amended form.

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: A. G. Hagenbucher
B. J. Schachenmann

Summary of Facts and Submissions

I. The appellant filed an opposition against European patent No. 279 613 and now contests the interlocutory decision of the opposition division to maintain the patent in amended form in accordance with the auxiliary request filed during oral proceedings before the opposition division on 1 March 1996.

II. The following documents cited in support of the opposition remain relevant to the present appeal:

D2: JP-A-56-11624 (reference is made to the English partial translation of the document filed by the opponent - now appellant, the accuracy of which has not been contested by the respondent)

and

D4: US-A-4 316 927.

III. Oral proceedings were held before the board on 17 March 1998, at which, for reasons of clarity and legibility, the respondent filed an amended patent specification, consisting of description, pages 2 to 6, claims 1 to 8 and Figures 1 to 3.

IV. Claim 1 filed during the oral proceedings corresponds to claim 1 accepted by the opposition division and reads as follows:

"1. A magnetic recording tape comprising:
a thin magnetic layer carried on a non-magnetic support film, said non-magnetic support film having a thickness of between 5 and 25 micrometers, a Young's modulus in the longitudinal direction of at least 350 kg/mm² and a ratio of the Young's modulus in the

longitudinal direction to the Young's modulus in the transverse direction from 0.3 to below 0.45; said magnetic layer having a Young's modulus in the longitudinal direction of between 350 and 2800 kg/mm² and a Young's modulus in the transverse direction of between 200 and 1500 kg/mm²."

Claims 2 to 8 are dependent on claim 1.

V. The appellant argued essentially as follows:

Only the nature of the non-magnetic support film was responsible for the spacing between the head and the tape. The details of the magnetic layer specified in claim 1 did not contribute to the inventive step of the claimed subject-matter. The characteristics of the magnetic layer were standard and known from D4. The skilled person would put the magnetic layer known from D4 on the non-magnetic support film described in D2, which also gave information about a magnetic layer. The reference to a video tape (see "jitter on TV screen") in D2 implied a magnetic layer having the usual properties. Contrary to the statements on page 8, second complete paragraph of the decision under appeal, Examples 3, 4 and 9 of the patent specification were not clearly within the definition of claim 1, because the Tables 1 and 2 did not define the parameters of the magnetic layer. Page 5, line 56 ff. of the patent specification indicated only the thickness of the magnetic layer, 5.2 µm, and page 5, lines 22 to 24 disclosed that layers with acicular particles typically have a MLD (Young's modulus in the longitudinal direction) between about 350 and 2800 kg/mm² and a MTD (Young's modulus in the transverse direction) between 200 and 1400 kg/mm². In Examples 3, 4 and 9 MLD was not within the preferred range of between 700 and 2100 kg/mm² (see page 5, line 23). All the examples and comparative Examples 1 to 9 of the patent specification

satisfied industrial standards (see page 5, lines 32 to 34). Some comparative examples were better than Examples 3, 4 and 9. The ratio of $MLD/MTD = 0.45$ known from sample 1 of D2 was in practice not distinguishable from the ratio $0.44999\dots$, which is "below 0.45" as specified in the claim. D2 suggested the use of a support film with a MLD/MTD ratio ≤ 0.77 , preferably ≤ 0.66 and showed in Table 2 sample 1 with a ratio of 0.45. In view of the tendency to lower ratios derivable from D2 it was clear to a person skilled in the art that lower ratios than 0.45 were possible. This tendency was supported by the good properties set out on pages 7 and 8 of D2, translation, especially for sample 1. The tapes produced according to D2 had the same properties as those described on page 5, lines 2 to 7, of the patent specification because the ratio $MLD/MTD = 0.45$ of sample 1 was below the value 0.5 indicated on page 5, line 4 of the patent specification at which the transition from edge contact to centre contact occurred. It was clear that the person skilled in the art would put the magnetic layer on such a support film.

Although D4 suggested and claimed a range of ratios MLD/MTD between 0.5 and 0.9, the skilled person would also consider Example 8 in Table II of D4 with a MLD/MTD of 0.4 which led to a relatively good head contact but insufficient mechanical strength. To overcome this weakness the person skilled in the art would just increase the MLD value from 300 kg/mm^2 to 350 kg/mm^2 in order to improve the mechanical strength and put the magnetic layer known from D4 on such a support film and thus arrive at the claimed invention. Since the respondent admitted that the magnetic layer had no effect for solving the underlying problem, D2 was more important than D4. Sample 1 of D2 gave the desirable centre contact configuration mentioned on page 5, lines 2 to 7 of the patent specification. If D2

disclosed a ratio $MLD/MTD < 0.45$, the subject-matter of claim 1 would lack novelty. Since there were many skilled persons who tried to avoid patents such as D4 claiming a ratio MLD/MTD from 0.5 to 0.9, such persons would try ratios below 0.45 and thus arrive at the subject-matter of claim 1. The examples in the patent were not better than those in D2. There was therefore no "selection invention".

VI. The respondent's arguments can be summarised as follows:

Although the appellant had not contested novelty, he had mixed arguments attacking on the one hand novelty and on the other hand inventive step. In the present case it had to be decided whether the claimed subject-matter involved an inventive step in accordance with the problem/solution approach. As far as the problem underlying the subject-matter of the present claim 1 was concerned, it had to be considered that D2 did not say anything about improving head-tape spacing at the centre region of the head. D2 showed an example with $MLD/MTD = 0.45$ but did not describe anything below 0.45. Faced with the present problem the skilled person would not look at D2 but at best at D4 which dealt with a solution to the problem of good head contact. Since D4 recommended a range of ratios MLD/MTD between 0.5 to 0.9 for a good head contact, and this range was even specified in claim 1 of D4, it was not clear why the person skilled in the art would deliberately go outside it. According to the appellant's arguments the skilled person was supposed to manipulate the range of ratios in D4 in the light of D2, but he would not even look at D2 because it addressed a different problem. This argumentation was not based on D4 at its face value but on a hindsight interpretation of D4. The purpose of the examples and comparative Examples 1 to 9 in Tables 1 and 2 of the patent was to illustrate the effect of the

change of the ratio MLD/MTD on the head to tape spacing. The magnetic layer recited in claim 1 and described elsewhere in the patent was only significant in terms of novelty but not in terms of inventive step. D4 provided a certain answer to the actual problem, but a different one going against the teaching of present claim 1. D2 did not address this problem and did not teach lowering the ratio MLD/MTD below 0.45. D2 showed good results in some respects but not in the aspect with which the patent in suit was specifically concerned, i.e. to provide a tape with good head cleaning characteristics. Good cleaning properties were dependent on the head to tape spacing which was not considered in D2. Since the prior art did not teach what the inventors had discovered, the claimed subject-matter undoubtedly involved an inventive step.

VII. The appellant requested that the decision under appeal be set aside and that the European patent No. 279 613 be revoked.

VIII. The respondent (patentee) requested that the patent be maintained on the basis of the amended patent documents, namely: description, pages 2 to 6, claims 1 to 8 and Figures 1 to 3, all as filed during the oral proceedings on 17 March 1998.

Reasons for the Decision

1. The appeal is admissible.
2. *Article 123(2) and (3) EPC*
 - 2.1 Claim 1 has been restricted with respect to granted claim 1 by incorporating the features of granted claim 10 and features from the description for the Young's modulus in the longitudinal direction (MLD = 350 kg/mm², see EP-B1-279 613, page 4, line 55) and for the ratio MLD/MTD (below 0.45, see EP-B1-279 613, Tables 1 and 2, Examples 3, 4 and 9 and granted claim 3). New claim 4 has been clarified in order to distinguish the Young's modulus of the support film from that of the magnetic layer. New claim 1 is narrower in scope than granted claim 1. The description has been adapted to the narrower scope of new claim 1.
 - 2.2 The amended version filed in the oral proceedings on 17 March 1998 differs from the version maintained by the opposition division only in that the handwritten amendments are more easily legible and a few inconsistencies have been removed.
 - 2.3 Hence, the present amended version of the patent complies with the requirements of Article 123(2) and (3) EPC.
3. *Novelty*
 - 3.1 In the notice of opposition the appellant attacked claim 1 of the patent as granted for lack of novelty and lack of an inventive step. As mentioned in

paragraph 2.1 above, the present claim 1 is narrower than granted claim 1. In particular, the range of the Young's moduli of the magnetic layer (from granted claim 10) has been inserted.

3.2 Although the translation of D2 suggests the use of a support film with a ratio $MLD/MTD \leq 0.77$, preferably ≤ 0.66 and shows in Table 2 sample 1 with a ratio of 0.45, it does not describe a support film with a ratio MLD/MTD below 0.45. Moreover, according to the partial translation of D2 the magnetic layer comprises Gamma iron oxide having an average long-diameter of 0.52 micrometer, an acicular form ratio of 9:1, a saturation magnetisation of 347 emu/cm^2 and a coercive force of 350 Oe. However, the values of Young's moduli in the longitudinal and transverse directions for the magnetic layer are not given in D2. Therefore, the subject-matter of claim 1 is new over D2.

3.3 As far as D4 is concerned, the described embodiments which are closest to the subject-matter of claim 1 are Examaples 7 and 8 in Table II of D4. Example 8 concerns a video tape with a ratio of the Young's moduli $MLD/MTD = 0.4$, but with a Young's modulus in the longitudinal direction $MLD = 300 \text{ kg/mm}^2$ that is smaller than the lower limit of 350 kg/mm^2 specified in claim 1 for the support film. According to Example 7 $MLD = 350 \text{ kg/mm}^2$ but $MLD/MTD = 0.5$, which is above the range specified in claim 1.

Hence, the subject-matter of claim 1 is also new over D4.

4. *Inventive step*

4.1 Closest prior art and problem underlying the present invention.

The introduction of the present patent specification explains that the prior art of magnetic recording media has concentrated on improving electromagnetics through improvements in the magnetic layer and on keeping deposits from building up on the head. In order to combat the problem of head build-up cleaning agents have been added to the magnetic coating layer, but these head cleaning agents are typically non-magnetic particles which have a higher degree of abrasivity than the magnetic coating layer. Starting from this generally known prior art, the problem addressed by the present invention is to provide a tape having substantially improved electromagnetic properties which utilises presently known magnetic layers and to provide a tape which exhibits improved head cleaning characteristics without additional head cleaning agents being added to the magnetic layer.

4.2 Solution

According to the patent specification (page 1, lines 50 to 54) the solution in claim 1 of this problem is based on the discovery that in a series of tapes in which the Young's modulus in the transverse direction is increased relatively to the Young's modulus in the longitudinal direction a point is reached where it is believed a configurational change occurs in the tape as it moves over the head. This configurational change allows the tape to more closely approach or contact the centre gap region of the head resulting in greatly improved electromagnetics and head cleaning action. Figures 2 and 3 of the present patent show curves of

head to tape spacing versus ratio of MLD/MTD. From these curves it is evident that head to media spacing decreases at a relatively steady rate as the ratio of MLD/MTD is decreased. A plateau region is reached where the ratio of decrease of head to media spacing drastically slows relative to a continued decrease in the MLD/MTD ratio. According to the patent specification it is assumed that this plateau region represents a region of configurational change, from an edge contact configuration to a centre contact configuration. After the plateau region, the rate of improvement in head to media spacing with further decrease of MLD/MTD ratio increases at a substantially greater rate than prior to the plateau region. The range for the MLD/MTD ratio of the support film of 0.3 to below 0.45 specified in claim 1 is aimed at utilising this greater improvement in head to media spacing lying beyond the plateau region.

- 4.3 Document D4 is concerned with providing a magnetic recording tape exhibiting improved contact with the recording head with a view to improving recording performance. The head-cleaning characteristics of recording tapes are not mentioned. The disclosure indicates the importance of the tensile moduli of both the support layer and the magnetic layer of the tape if improved head contact is to be achieved. Document D4 concludes from Examples 1 to 8 of Table II that head contact is not deteriorated when MLD/MTD is from 0.5 to 0.9 whereas it is deteriorated when this ratio is in excess of 0.9. Only Example 8 referred to by the appellant, exhibits a lower MLD/MTD ratio than 0.5, namely 0.4. Example 8 has the additional parameters $MLD = 300 \text{ kg/mm}^2$ and $MTD = 750 \text{ kg/mm}^2$. The head contact of Example 8 is qualified in Table II by the letter B, which signifies according to column 2, lines 31 to 36 "a not so good result in that the output signal is distorted upward and downward at the central portion".

In column 6, lines 36 to 41 it is stated that Example 8 shows a relatively good head contact, however, the mechanical strength such as the load for 5% elongation, is not sufficient so that a tracking deviation and the like are apt to occur when the tape is used in a video cassette. Immediately after this discussion of Example 8 document D4 concludes:

"Accordingly, it is indispensable that the Young's modulus of the base film in the longitudinal direction is in excess of 350 kg/mm²" and MLD/MTD "is in the range from 0.5 to 0.9, from the view point of the head contact".

In the appellant's view the skilled person would as a consequence of the insufficient mechanical strength and the relatively good head contact mentioned in D4 for Example 8 just increase in Example 8 MLD from 300 to 350. The board cannot share this opinion. In view of D4, Table II and the conclusion reached there in this context the person skilled in the art would take instead of Example 8, Example 7 with MLD = 350 and the ratio MLD/MTD = 0.5. The alleged simple modification of Example 8, seems to be the result of hindsight.

- 4.4 Document D2 describes the formation of various magnetic recording tapes, by providing various support films, listed in Table 2, with a magnetic layer details of which are given on pages 5 and 6 of the translation. Particular aspects of the performance of the tapes are described and summarized in Table 4, but there is no reference in the translation of D2 to the head-cleaning characteristics of recording tapes and no suggestion that the problem of preventing the build-up of deposits on a recording head should be addressed through appropriate choice of the tensile moduli of the support layer and the magnetic layer of the tapes. The skilled person, seeking to improve not only the electromagnetic

performance but also the head-cleaning performance of a magnetic recording tape, would not be prompted by the disclosure of document D2 to provide a tape having the features defined in the present claim 1. Sample 1 in Table 2 concerns a non-magnetic support film with a ratio $MLD/MTD = 0.45$. Only aspects concerning jitter, skew, bending, crease occurrence ratio and tape breaking occurrence ratio of this sample are analysed on pages 7 and 8 of D2.

4.5 Summing up, it is concluded that although D2 and D4 disclose non-magnetic support films with ratios of MLD/MTD below about 0.5, these documents do not, even if considered in combination, hint at making use of the transition from an edge contact configuration with a head to the centre contact configuration for improving not only the electromagnetic performance but also the head-cleaning performance of the magnetic recording tape by selecting the range of MLD/MTD ratios from 0.3 to below 0.45 and a Young's modulus MLD of at least 350 kg/mm^2 . Hence, the subject-matter of claim 1 involves an inventive step.

5. In the opinion of the board, independent claim 1, together with the dependent claims 2 to 8 are allowable. The patent can be maintained in the amended form requested by the respondent.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the opposition division with the order to maintain the patent with description pages 2 to 6, claims 1 to 8 and Figures 1 to 3 all as filed during the oral proceedings on 17 March 1998.

The Registrar:



M. Kiehl

The Chairman:



W. J. L. Wheeler