BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

A		B	X	C	

File No.: T 0253/92 - 3.5.2

Application No.: 86 303 573.9

Publication No.: 0 202 834

Classification: H01F 1/04

Title of invention: Permanent magnet alloy

D E C I S I O N
of 22 October 1993

Applicant: -

Proprietor of the patent: Crucible Materials Corporation

Opponent: N.V. Philips' Gloeilampenfabrieken;
Vacuumschmelze GmbH;
Hitachi Metals, Ltd;
Sumitomo Special Metals Co. Ltd.

Headword:

EPC: Art. 56, 123(3), 54

Keyword: "novelty (yes) - "inventive step (no)" - "Claim to use of an alloy gives narrower protection than claim to the alloy *per se*"

Headnote
Catchwords

Case Number: T 0253/92 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 22 October 1993

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office dated 22 January 1992 revoking European patent No. 0 202 834 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: R.E. Persson
Members: W.J.L. Wheeler
A.G. Hagenbucher

Summary of Facts and Submissions

I. The Appellant contests the decision of the Opposition Division revoking European patent No. 0 202 834 on the ground that the subject-matter of Claim 1 submitted at the oral proceedings held before the Opposition Division on 12 December 1991 was not novel in view of the disclosure in

D1: J. Ormerod: "PROCESSING AND PHYSICAL METALLURGY OF NdFeB AND OTHER R.E. MAGNETS" on pages 69 to 90 of "Nd-Fe PERMANENT MAGNETS - THEIR PRESENT AND FUTURE APPLICATIONS, Report and proceedings of a Workshop meeting held in Brussels on 25 October 1984". This document will be referred to as D1(a) in the present decision.

II. Many other documents were cited in the proceedings before the Opposition Division, of which the following documents were referred to in the present appeal:

D2: C. Herget: "METALLURGICAL WAYS TO NdFeB ALLOYS, PERMANENT MAGNETS FROM CO-REDUCED NdFeB" on pages 407 to 422 of "PROCEEDINGS OF THE EIGHTH INTERNATIONAL WORKSHOP ON RARE-EARTH MAGNETS AND THEIR APPLICATIONS and the FOURTH INTERNATIONAL SYMPOSIUM ON MAGNETIC ANISOTROPY AND COERCIVITY IN RARE EARTH-TRANSITION METAL ALLOYS, Dayton, Ohio, USA - May 1985"

D6: J. Houska *et al*: "Technical Note: Fine Grinding of Rare Earth Cobalt Alloys with CHRISPRO Jet Mills in Inert Gas Cycle" in Powder metallurgy international, Vol. 15, No. 4, 1983, pages 206 and 207

EP-A-0 126 179

J. Ormerod: "THE PHYSICAL METALLURGY AND PROCESSING OF SINTERED RARE EARTH PERMANENT MAGNETS" on pages 49 to 69 of Journal of the LESS-COMMON METALS, Vol. 111 (1985), containing papers presented at the International Rare Earth Conference, Zurich, Switzerland, March 4 - 8, 1985. This document will be referred to as D1(b).

III. The Appellant pointed out that the Ormerod citations D1(a and b) were published on 31 January 1986 and 29 October 1985 respectively, after the priority date of the patent in suit. The Appellant filed letters from the publisher of D1(a) and D1(b) (Elsevier) to support this. The Appellant also filed an affidavit from Mr. Ormerod, author of D1(a) and D1(b), in which he stated, *inter alia*, that they were not verbatim reports of his oral presentations in the Brussels and Zurich conferences. To the best of his knowledge, no documents corresponding to D1(a) or D1(b) were distributed at those conferences. His records showed that he had not disclosed Figures 8 and 16 and the related text of D1(a) in Brussels or Figure 8 and the related text of D1(b) in Zurich.

IV. In oral proceedings held before the Board on 29 September 1993, the Respondents argued that the contents of D1(a and b), with the possible exception of those parts referred to in Mr. Ormerod's affidavit, must have been presented at the Brussels and Zurich conferences. There was a footnote on page 49 of D1(b): "Paper presented at the International Rare Earth Conference, ETH Zurich, March 4 - 8, 1985." Throughout D1(a), comparisons were made between SmCo and NdFeB magnets. It was therefore unlikely that Figure 8, which showed such a comparison, was omitted from the oral presentations. In the affidavit signed 1 November 1991 by Mr. Narasimhan (co-inventor of the patent in suit), filed in the proceedings before the Opposition Division,

it was stated that the disclosure of D1(b) was presented in Zurich in March 1985 (point 12 of the affidavit).

V. The Board decided in the oral proceedings that it would disregard documents D1(a and b).

VI. The Appellant filed three sets of amended claims in the oral proceedings, to be considered as a main and first and second auxiliary requests.

Claim 1 of the main request is worded as follows:

"1. A method of making a permanent magnet alloy consisting essentially of, in weight percent, 30 to 36 of at least one rare earth element, 60 - 66 iron and balance boron characterised in that oxygen is added to the magnet alloy during processing by jet milling in an oxygen containing atmosphere to give an oxygen content in the permanent magnet alloy in the range of 6000 ppm to 30000 ppm."

The subject-matter of Claim 1 of the first auxiliary request is the same as that of Claim1 of the main request, but the feature of an oxygen content in the range of 6000 ppm to 30000 ppm appears in the preamble of the claim.

The main and first auxiliary requests include the same independent Claim 5, worded as follows:

"5. A permanent magnet alloy comprised in a permanent magnet and consisting essentially of, in weight percent, 30 to 36 of at least one rare earth element, 60 to 66 iron, oxygen in the range of 6000 to 30000 ppm and balance boron characterised in that the magnet is a sintered permanent magnet having a combination of

excellent resistance to disintegration and an energy product of at least 28.1 MGOe."

The other claims according to these requests are dependent claims.

Claim 1 according to the second auxiliary request is worded as follows:

"1. Use of a permanent magnet alloy in a permanent magnet said alloy consisting essentially of, in weigh percent, 30 to 36 of at least one rare earth element, 60 to 66 iron, oxygen in the range of 6000 to 30000 ppm and balance boron so that the alloy imparts to the magnet a combination of high resistance to disintegration under high-temperature, humid conditions and an energy product of at least 28.1 MGOe."

The second auxiliary request includes dependent Claims 2 to 4.

VII. Regarding Claim 5 of the main request and first auxiliary request, the Respondents argued essentially that D2 was distributed to participants at the Workshop held in Dayton on May 6 to 8, 1985, as was confirmed by the affidavits of Masaaki Tokunga and Hideki Harada, each of whom attended the Workshop and bought a copy of D2 there. D2 disclosed sintered permanent magnets made from NdFeB alloys having weight percentages of Nd and Fe falling within the ranges of 30 to 36 and 60 to 66 specified in the claim, see page 414, Table I, 2nd, 3rd, 5th and 6th lines. The fact that the alloy in the 5th line included a small amount of Al and the alloy in the 6th line included Dy, bringing the total rare earth content to 36.46 wt%, did not mean that they fell outside the claim, because the claim included the phrase "consisting essentially of". Al was a typical impurity

in ferroboron, see D2, page 413, lines 20 to 22. The presence of oxygen was unavoidable, it was needed for passivation of the rare earth element. According to the last paragraph on page 415 of D2 the oxygen content in the finished magnets was between 0.6 and 0.8%, i.e. between 6000 and 8000 ppm, which was within the range specified in the claim. The alloy shown in the 3rd line of Table II on page 416 of D2 was the same as that shown in the 5th line of Table I and had an energy product of 29.8 MGOe, above the lower limit of 28.1 MGOe specified in the claim. The alloy shown in the 4th line of Table II was the same as that shown in the 6th line of Table I and had an energy product of 28.0 MGOe, which was very close to the lower limit specified in the claim. It was not clear what was meant by "excellent resistance to disintegration" in the claim. It was not a solution feature, merely a problem feature in respect of an obviously desirable property, which the magnets made by the method described on pages 413 to 415 of D2 must also have had, as was implied by the last sentence on page 412 and the first paragraph on page 413 of D2.

VIII. The Appellant did not contest that D2 belonged to the prior art. Regarding Claim 5 of the main request and first auxiliary request, the Appellant argued in effect that only the 2nd and 3rd alloys in Table I on page 414 of D2 had Nd, Fe and B contents as specified in the claim. The magnetic properties of the 3rd alloy were given in the first line of Table II on page 416, from which it could be seen the energy product was only 21.0 MGOe. D2 did not disclose a magnet of the composition specified in the claim having the properties specified in the claim. The inventors had gone against the conventional practice of aiming to keep the oxygen content of the alloy as low as possible in order not to impair its magnetic properties. They had discovered that the presence of oxygen in the range specified in the

claim unexpectedly gave the magnet an excellent resistance to disintegration under high-temperature humid conditions, as was explained in the patent in suit with reference to the single figure, while retaining a high energy product.

IX. Regarding Claim 1 of the main request and first auxiliary request, the Respondents argued essentially that jet milling in an atmosphere having a controlled oxygen content was known from D6. D6 disclosed that jet milling produced homogeneous particles with less impurities than abrasion milling. It was therefore obvious to make the alloys known from D2 by jet milling in an oxygen containing atmosphere.

X. The Appellant replied that D6 concerned only rare earth cobalt alloys and that the oxygen content was only 2000 to 4000 ppm.

XI. Regarding Claim 1 of the second auxiliary request, the Appellant argued that, following the decision G2/88 of the Enlarged Board of Appeal, the discovery of an inherent property could contribute to an invention and the purpose of imparting a high resistance to disintegration and a high energy product should be interpreted as a technical feature of the claim. The use claim did not extend the scope of protection, since Claim1 as granted was for the alloy *Per se*, irrespective of what use was made of it, and Claim1 of the second auxiliary request limited the scope to one particular use of the alloy.

XII. The Respondents replied in effect that the alloy was known *Per se*. Its use in permanent magnets was also known *Per se* and must have brought about the same effects. The claim did not really define a new use.

XIII. The Appellant requested that the decision of the Opposition Division be set aside and that a patent be maintained in amended form on the basis of Claims 1 to 8 according to the main request, or Claims 1 to 8 according to the first auxiliary request, or Claims 1 to 4 according to the second auxiliary request.

XIV. The Respondents (Opponents II, III and IV) requested that the appeal be dismissed. Opponent I (Philips) did not make any submissions or requests in writing and did not attend the oral proceedings before the Board.

XV. The Board reserved its decision.

Reasons for the Decision

1. The appeal is admissible.

2. As announced in the oral proceedings, the Board decided to disregard documents D1(a and b). The documents themselves were not published before the priority date of the patent in suit, and, in the light of Mr. Ormerod's affidavit, it is not possible to be sufficiently sure of exactly what was presented in the conferences in Brussels and Zurich. Mr. Narasimhan's affidavit does not dispel the doubt: he may have just assumed that D1(b) had been presented in the Zurich conference, in view of the footnote on page 49. Speculation about what Mr. Ormerod must have said does not help here. In the Board's opinion, the benefit of any doubt on this point must be given to the Appellant.

3. Turning now to the question of whether the subject-matter of the claims is novel and involves an

inventive step, it is convenient to consider Claim 5 of the main and first auxiliary request first.

3.1 Document D2 discloses permanent magnets made from alloys with, *inter alia*, the following compositions, in weight percent:

Nd 33.03, Fe 65.65, B 1.32 (line 2 of Table I on page 414)

Nd 34.0, Fe 60.95, B 1.26 (line 3 of Table I)

Nd 32.66, Fe 64.0, B 1.10, Al 0.71 (line 5 of Table I)

Nd 32.36, Dy 4.10, Fe 60.47, B 1.24 (line 6 of Table I).

D2 describes a calciothermic method of making NdFeB alloys (see page 413) and a method of making magnets from them (see pages 414 to 416), which includes sintering (see page 415, 4th paragraph). According to the last paragraph on page 415 of D2, it is possible to stabilize the oxygen content in the finished magnets between 0.6 and 0.8 %. This is the same as saying between 6000 and 8000 ppm. A list of typical impurity levels is given on page 413 of D2, from which it appears that 0.10 to 0.20 % Al typically occurs as an impurity. Various magnetic properties of the magnets are given in Table II on page 416 of D2, including the energy products for magnets made from the 2nd, 3rd and 4th alloys listed above, which are given as 21.0, 29.8 and 28.0 MGOe respectively.

3.2 There can be no doubt that when a permanent magnet is made by the method disclosed in D2 from either of the first two alloys mentioned in paragraph 3.1, the alloy in the magnet consists of a rare earth element, iron, oxygen and boron present in the ranges specified in the

claim. And, in the opinion of the Board, magnets made from the 4th alloy may be considered to have a composition required by the claim, since the phrase "consisting essentially of" may be fairly construed as permitting small excursions beyond the stated ranges. Regarding the 3rd alloy, the phrase "consisting essentially of" may be fairly construed as permitting the presence of natural impurities, but the Al content of the 3rd alloy is 0.71 % Al, which is more than three times the natural impurity level of 0.2% and, indeed, is nearly as much as two thirds of the boron content (1.10%) of the alloy. In the opinion of the Board, such an amount of Al cannot be neglected and the alloy cannot be considered as consisting essentially of Nd, Fe, B and oxygen in the proportions required by the claim. The Board therefore agrees with the Appellant that D2 does not disclose an alloy having a composition required by the claim in a permanent magnet having an energy product of at least 28.1 MGOe as specified in the claim (although the 4th alloy comes very close to it).

3.3 The Respondents referred to EP-A-0 126 179, pointing out that alloys were disclosed on page 9 having a composition of 8 to 30% rare earth, 2 to 28% boron, balance iron with inevitable impurities, including a maximum of 2% oxygen. The Board notes that the percentages there are atomic percentages. It appears that the percentages of Nd, Fe and B in some of the possible alloys meeting the range conditions specified on pages 9 and 10 of EP-A-0 126 179 would also fall within the range conditions in the claim. The energy product of the most preferred of these alloys is given at the end of the first paragraph on page 10 as 30 MGOe, which is above the value of 28.1 MGOe specified in the claim. However, 2 at% oxygen corresponds to only about 0.5 wt% oxygen, i.e 5000 ppm, which is below the lower limit of 6000 ppm specified in the claim. The Board

therefore agrees with the Appellant that EP-A-0 126 179 does not disclose a magnetic alloy having a composition required by the claim.

3.4 Consequently, the subject-matter of Claim 5 of the main and first auxiliary requests has not been shown to lack novelty.

3.5 The subject-matter of Claim 5 of the main and first auxiliary requests differs from the prior art disclosed in D2 only in that the magnet has "a combination of excellent resistance to disintegration and an energy product of at least 28.1 MGOe." This phrase merely defines obviously desirable properties of the magnet and the Board notes that there is no teaching in the claim, and very little elsewhere in the patent specification, as to how they are to be obtained.

3.6 Regarding the property of excellent resistance to disintegration, the Board agrees with the Respondents that it is implicit that the alloys prepared by the method described on page 413 of D2 offer a better resistance to disintegration than alloys made by the earlier methods referred to on page 412 of D2. This may be deduced from the last sentence on page 412, where it is stated that "this eutectic is place of a heavy corrosion observed to proceed up to a complete pulverisation of sintered or compacted bodies", and the first sentence on page 413, where it is stated that the authors "have therefore developed a new, proprietary leaching procedure that enables us to remove the excess calcium and the byproduct CaO in spite of the corrosive nature of the Sumitomo type NdFeB alloys and to produce such alloys in high quality and with a great variety of compositions."

3.7 Regarding the property of an energy product of at least 28.1 MGOe, in view of the fact that the NdFeB alloy in the third line of Table I on page 414 of D2 has an energy product of only 21.0 MGOe (see line 1 of Table II on page 415 of D2), it appears that an energy product of at least 28.1 MGOe is not an inevitable result of choosing the proportions of rare earth element, iron, boron and oxygen to be within the ranges specified in the claim. However, the patent specification has been drafted on the implicit assumption that the skilled person would be able to obtain this property, by applying his normal skill in carrying out routine experiments.

3.8 In the opinion of the Board, it is obvious to a person skilled in the art that the disclosure in D2 is rather promising and deserves further investigation. In other words, it is obvious to a person skilled in the art to experiment with different NdFeB alloys having compositions around those of the better examples given in the tables of D2, and to measure their magnetic properties, and, in the course of such routine experimental work, discover the alloys which have a combination of excellent resistance to disintegration and a energy product of at least 28.1 MGOe, since these are not "hidden" properties in the sense that it would not have been obvious to test for them. On the contrary, they are the very properties that the skilled person would be trying to obtain. Furthermore, it does not appear that it would be necessary to overcome a prejudice by raising the oxygen content of the alloys in order to discover the alloys with the properties required by the claim, since the alloys known from D2 already have oxygen contents within the range specified in the claim. The fact that this range extends upwards to include higher oxygen contents than have been previously thought desirable does not alter the fact

that it includes at its lower end oxygen contents which are disclosed in D2.

3.9 The Board therefore concludes that the subject-matter of Claim 5 of the main and first auxiliary requests does not involve an inventive step within the meaning of Article 56 EPC. Furthermore, in the opinion of the Board, the method of making the alloy according to Claim 1 of the main and first auxiliary request is also obvious in view of the disclosure in D6 of the advantages of jet milling over attritor milling (the method used in D2, see page 415, first paragraph). Consequently, these requests have to be refused.

4. Regarding the second auxiliary request, Claim 1 of which is a so-called use claim, recited in paragraph VI above, the Appellant is relying in effect on the decision G2/88 of the Enlarged Board of Appeal (OJ EPO, 1990, 93).

4.1 In the opinion of the Board, contrary to the view expressed in the fourth paragraph on page 2 of the decision of the Opposition Division, such a use claim is not open to objection under Article 123(3) EPC. The claims as granted conferred absolute protection upon the permanent magnet alloy *Per se*. Since it is not possible to use the alloy without having it, all known and unknown uses of the alloy were also covered. Claim 1 of the second auxiliary request does not extend the protection conferred by the patent, it limits it to a specific use of the alloy. This is in line with point 5 of the reasons given in the decision G2/88 and point (ii) of the order of that decision.

4.2 As reviewed in paragraph 3.1 above, D2 describes the use of permanent magnetic alloys having compositions covered by the claim for the purpose of making permanent magnets. Thus the subject-matter of Claim 1 of the

second auxiliary request differs from the prior art disclosed in D2 only in that "the alloy imparts to the magnet a combination of high resistance to disintegration under high-temperature, humid conditions and an energy product of at least 28.1 MGOe." As noted in paragraphs 3.5 and 3.7 above, the patent specification has been drafted on the implicit assumption that the skilled person would be able to find alloys having these properties. In order to be sure of the resistance to disintegration, it would be obvious to do an accelerated test by raising the humidity and temperature. Once alloys with the required properties had been found, it would be obvious to use them in a permanent magnet, as claimed in Claim 1 of the second auxiliary request.

4.3 In the Board's opinion, the decision G2/88 does not help the Appellant. It explains how use claims should be interpreted. Point (iii) of the order states: "A claim to the use of a known compound for a particular purpose, which is based on a technical effect which is described in the patent, should be interpreted as including that technical effect as a functional technical feature, and is accordingly not open to objection under Article 54(1) EPC provided that such technical feature has not previously been made available to the public." The decision does not say, or imply, that such claims are exempt from objection to lack of an inventive step. In the present case, use is made of an alloy having readily discoverable properties that make it obviously suitable for that use.

4.4 The Board concludes that the subject-matter of Claim 1 of the second auxiliary request does not involve an inventive step within the meaning of Article 56 EPC, and that, consequently, the request has to be refused.

5. The Board considers it to be worthwhile to remark in passing that if the skilled person was not already able to obtain alloys having a combination of excellent resistance to disintegration and an energy product of at least 28.1 MGOe, by applying his normal skill in carrying out routine experiments in the manner outlined in paragraph 3.8 above, the teaching of the patent would be insufficient, since it does not disclose any technical information, other than a brief reference to jet milling in an oxygen containing atmosphere, about how to obtain the properties specified in the claims. This point was, however, not argued by the Respondents.

6. A letter was filed by Opponent III on 4 October 1993, after the oral proceedings. For avoidance of doubt, it is recorded that this letter has been disregarded by the Board as being filed too late.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Kiehl E. Persson