

## Technical Board of Appeal, 24 May 1993, Kawasaki Steel



### PATENT LAW

Envisaged product is not obvious if inventive method is required to make it

- a product which can be envisaged as such with all characteristics determining its identity together with its properties in use, i.e. an otherwise obvious entity, may become nevertheless non-obvious and claimable as such if there is no known way or applicable (analogy) method in the art to make it and the claimed methods for its preparation are therefore the first to achieve this in an inventive manner.

- Conversely, should the method claims not be allowable because their subject-matter is obvious, then the product claim linked to them in the respective request could not be allowable either on the basis of the method alone.

- The allowability of the method claims must therefore also be investigated.

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### Technical Board of Appeal, 24 May 1993

(G.S.A. Szabo, W.D. Weiß, M.K.S. Aúz Castro)

Decision of Technical Board

of Appeal 3.2.2

dated 24 May 1993

T 595/90 Composition of the Board:

[...]

Patent proprietor/Appellant III:

KAWASAKI STEEL CORPORATION

Opponent I/Appellant IV: Nippon

Steel Corporation

Opponent II/Appellant II: Thyssen

Stahl AG

Opponent III/Appellant I: Ugine

Aciers de Chatillon et Gueugnon

S.A.

Keyword: "Method claim; inventive step (no)" - "Product made by method also not inventive" - "Basis of decision - right to be heard - oral proceedings"

#### Headnote

I. Observations submitted after the "adjournment" of the oral proceedings, which means the closing of the debate are disregarded by the Board unless it reopens

the debate. The reopening depends on the Board's discretion (point 1 of the Reasons).

II. A product which can be envisaged as such with all the characteristics determining its identity, including its properties in use, i.e. an otherwise obvious entity, may become nonobvious and claimable as such, if there is no known way or applicable (analogy) method in the art to make it and the claimed methods for its preparation are the first to achieve this and do so in an inventive manner (point 5 of the Reasons).

#### Summary of Facts and Submissions

I. European patent No. 0 047 129 was granted with effect of 24 April 1985 on the basis of European patent application No.81 303 891.6, filed on 26 August 1981. The set of claims as granted is headed by the independent Claims 1 and 2 which read as follows:

"1. A grain-oriented silicon steel sheet having an iron loss at W17/50 of less than 0.90 W/kg, a Si content of from 2 to 4%, a thickness of from 0.15 to 0.25 mm, an average crystal grain size of from 1 to 6 mm, and a forsterite coating per one surface on its surfaces of from 1 to 4 g/m<sup>2</sup> per surface.

2. A method for producing a grain-oriented silicon steel sheet by providing a grain-oriented silicon steel sheet containing from 2 to 4% of Si, subjecting the sheet to one cold rolling or to two or more cold rollings with an intermediate annealing treatment to obtain a final gauge, subjecting the cold rolled sheet to decarburizing annealing, coating the sheet with an annealing separating agent, and then subjecting the sheet to final annealing, characterised in that the steel includes at least one of Se and S in an amount of from 0.010 to 0.035 and at least one of Sb, As, Bi and Sn in an amount of from 0.010 to 0.080% as inhibitor, the cold rolling is carried out so as to obtain a final gauge of from 0.15 to 0.25 mm, the final annealing is carried out so that a forsterite coating is formed on the steel sheet surfaces in an amount of from 1 to 4 g/m<sup>2</sup> per surface, and the secondary crystallized grain size is from 1 to 6 mm so that the resultant sheet has an iron loss at W17/50 of less than 0.90 W/kg."

II. Three oppositions were filed on the main ground that the subject-matter of the European patent lacked an inventive step (Article 100(a) EPC). This objection was, inter alia, based on the following documents:

A(2) Journal of Applied Physics, Vol. 38 (1967), pages 1104 to 1108;

A(4) DE-A-2 923 374;

B(1) Nippon Steel Technical Report Overseas Number 4 (November 1973), pages 1 to 10;

B(3) DE-C-2 451 600.

III. In the opposition proceedings, the maintenance of the patent with an amendment in Claim 6 was requested as the main request and three auxiliary requests were filed additionally.

IV. By its decision of 19 June 1990, the Opposition Division decided that the documents according to the third auxiliary request met the requirements of the EPC and rejected the main, the first and the second auxiliary requests.

V. All the parties involved in the opposition proceedings have appealed against this decision in the following sequence:

Appellant I (Opponent III) on 21 July 1990;  
Appellant II (Opponent II) on 16 August 1990;  
Appellant III (proprietor) on 17 August 1990;  
Appellant IV (Opponent I) on 17 August 1990.

Appellants I, II and IV paid the appeal fee on the same date. The appeal fee of Appellant III was received on 13 August 1990.

The respective statements of grounds were filed on 23 October 1990, on 18 October 1990, on 15 October 1990, and on 26 October 1990.

VI. The arguments of Appellant III (the proprietor) presented in writing and during the oral proceedings of 6 May 1993 before the Board of Appeal can be summarised as follows:

Document B(1) had to be considered as the closest prior art. The difference of the product claim with respect to this document had to be seen in the feature that the patent suggested a forsterite coating of a certain weight in combination with a certain grain size to achieve an iron loss which was at least 5% lower than in any grain-oriented silicon steel sheet commercially available at the filing date. In this context it had to be considered that the 9 mil sheet of ORIENTCORE HI-B reported in Table 1 of document B(1) was a test sample prepared on a laboratory scale and not a commercially available product.

Document B(1) did not teach that adjusting the sheet thickness to a size from 0.15 to 0.25 mm and the average grain size to a range from 1 to 6 mm was likely to provide a route to obtaining an iron loss W17/50 of less than 0.90 W/kg. On the contrary, this document expressed a prejudice against doing this by indicating that "9-mil sheets were manufactured for some time with the object of producing lighter-gauge or higher-grade sheets, but the industrial production of 9-mil sheets became deadlocked for two reasons - high cost and failure to obtain the desired low iron loss" and "Littmann states that the lowest iron loss is obtainable with a sheet thickness of 6 mils, this however is hardly realisable in commercial products from the points of both manufacture and use". Document B(3) had to be seen as completely irrelevant, because its sole aim was to create a grain-oriented silicon steel sheet having a high induction value of B8 without paying attention to any iron loss. Moreover, only thick gauge steels of about 0.3 mm were produced by this known method. Consequently, this document delivered no incentive to direct the method disclosed therein in a manner that resulted in a product with the claimed features. VII. Against the patentability of the subject-matter of the contested patent the following arguments were in essence submitted by the other appellants (opponents).

Document B(3) was the closest prior art with respect to the method aspect of the patent in suit, because it disclosed the production of a highgrade grain-oriented silicon steel sheet using the same inhibitor system and forsterite as the major constituent of the glass coating. ... VIII. Appellant III (the proprietor) requested that the

decision under appeal be set aside and that the patent be maintained on the basis of Claims 1 to 7 as annexed to the decision under appeal as the main request. On an auxiliary basis it requested that the patent be maintained with: [...]. The other three appellants requested that the decision under appeal be set aside and that the European patent be revoked.

IX. At the end of the oral proceedings the Board reserved its decision.

X. On 8 May 1993 the Board received further observations from Appellant I (Opponent III) and on 25 May 1993 from Appellant III (proprietor of the patent).

## Reasons for the Decision

### 1. Admissibility and other procedural questions

The appeals are admissible. The observations filed by two parties, i.e. one of the opponents and the proprietor of the patent, on 8 and 25 May 1993 are disregarded because they were filed after the "adjournment of the oral proceedings". The adjournment of oral proceedings which means the closing of the debate (the French version, "prononcer la clôture des débats", and the German version, "die sachliche Debatte für beendet erklären" are clearer in this respect) normally terminates the possibility of further submissions. Observations submitted thereafter could only be taken into account if the Board reopened the debate (Article 113 EPC) which depends on its discretion. The Board sees no reason for this as the parties were given ample opportunity to present all the arguments they thought relevant. Besides, the submissions do not contain any matter which had not been discussed during oral proceedings.

### 2. Amendments

[...]

### 3. Novelty

[...].

4. The set of claims according to the main request is headed by two independent claims, Claim 1 being directed to a product and Claim 2 to a method. The independent method claim is identically contained also in the sets of claims according to the first and third auxiliary requests. Appellant III (proprietor) admitted in his statement that the specified steps of the independent method Claim 2 according to the main request would indispensably arrive at a product meeting all the features of the product Claim 1 according to the main request, when being fully carried out by a skilled person who is equipped with the usual general knowledge for the production of high-grade grain-oriented steels, at least with the further guidance of the description. The two claims are therefore implicitly linked and coterminous.

### 5. Product claim

Document B(1) is considered to be the closest state of the art with respect to the subject-matter of the product Claim 1. This document originated from a newly developed method to produce silicon steel sheet (ORIENTCORE HI-B) with a high degree of a cube-on-edge crystal orientation and hence with a high value of magnetic induction. It is well known and undisputed

by all the parties that ORIENTCORE HI-B material has a silicon content of about 3%. Induced by the requirements of the users, the manufacturer of such magnetic steel sheet was inevitably confronted with the problem of minimising the iron loss of the steel sheets without losing the high degree of crystal orientation. Document B(1) is the comprehensive report about investigations performed with the aim of finding out which parameters affected these qualities. The conclusions are as follows:

- The iron loss is dependent on sheet thickness and has a minimum between 5 and 10 mils (0.127 and 0.254 mm), provided that grain size, purity and degree of orientation are equal in each sample (Figure 12, Table 2).

- The iron loss is decreasing with decreasing grain size for grain sizes between about 0.5 to about 10 mm and is increasing sharply at still lower grain sizes, provided that purity, degree of orientation and thickness of the samples are equal (Figures 9A and 9B, and page 5, right column).

- The iron loss is dependent on the tensile stress exerted on the surface of the sheet by a glass film (page 5, right column). For an average grain size of 3.5 mm the iron loss has a minimum at a tensile stress between 0.3 and 0.5 kg/mm<sup>2</sup> (Figure 10).

Consequently, these results, which were performed on a laboratory scale, cover the teaching to a person skilled in the art to aim at a grain-oriented steel sheet having a thickness between 0.127 and 0.254 mm and a grain size in the middle of the range of 0.5 to 10 mm and then choose the thickness of the glass film such that the tensile stress it exerts on the surface of the sheet minimises the iron loss. He must, however, achieve this while maintaining as high a degree of orientation as possible. The latter condition is not only essential to guarantee a high flux density but also to maximise the influence of the tensile stress (applied by the glass film) on the reduction of the iron loss (Figure 3).

During the oral proceedings, there was agreement between the parties that forsterite has been the traditional material for the glass film separator formed on the surface of high grade silicon steel sheet. It was still used immediately before the priority date of the patent in suit (see Appendix I to the grounds of appeal of Appellant III/proprietor), for instance as so-called "mill glass" coating having a thickness of 1 mm corresponding to 2.58 MPa (see the abovementioned Appendix I). Therefore, the results displayed in Figure 4 of document B(1) are obtainable with a forsterite film of slightly less than 1 mm and the maximum tension effect which requires a stress of 0.4 Kg/mm<sup>2</sup> ((B1), page 5, last paragraph) is obtainable with a slightly thicker forsterite film.

Consequently, there is no reason why a skilled person should not interpret the word "glass film" used in document B(1) in the usual manner as to mean a forsterite film with a thickness in the usual range which means a glass film with the specification given in Claim 1.

Following these considerations, the subject-matter of the product Claim 1 according to the main and first auxiliary requests differs from this desirable product disclosed by document B(1) in that it specifies that the iron loss W17/50 should be less than 0.90 W/kg.

In view of the above, this difference corresponds to the known desideratum and is equivalent to the remark in document B(1) that the degree of orientation should be maintained as high as possible when the three parameters, thickness of the sheet, grain size and thickness of the coating, are adjusted to their optimum values. It follows that the claimed product only has properties which were fully predicted, and envisaged, i.e. the matter is obvious as such. This applies to all product claims in the main and the first three auxiliary requests.

However, at the date of the publication of document B(1) (1973), this desideratum, prima facie, was not yet actually achieved at least on an industrial scale, because this document is quite clear in mentioning that the reported effects, which had been verified on a laboratory scale, were hardly realisable in commercial products with sheet thicknesses of about 9 mil (0.23 mm) "from the points of both manufacture and use" (page 7, left column under Figure 11). But according to document (A2) (page 1108, Conclusion), this handicap was taken more as a challenge by the skilled metallurgist than an insurmountable prejudice.

The subject-matter of the product claim thus is only concerned with a known desideratum and not with a new problem. The allowability of Claim 1 according to the main and first auxiliary request is then linked to the answer to the question whether the desideratum disclosed by document B(1) was still unachievable at the priority date of the patent in suit or whether there was an obvious way leading to it. This is relevant since it is the view of the Board that a product which can be envisaged as such with all characteristics determining its identity together with its properties in use, i.e. an otherwise obvious entity, may become nevertheless non-obvious and claimable as such if there is no known way or applicable (analogy) method in the art to make it and the claimed methods for its preparation are therefore the first to achieve this in an inventive manner. Conversely, should the method claims not be allowable because their subject-matter is obvious, then the product claim linked to them in the respective request could not be allowable either on the basis of the method alone. The allowability of the method claims must therefore also be investigated.

## 6. Closest State of the Art

6.1 The Board considers document B(3) to be the closest state of the art with respect to the subject-matter of the method Claim 2 according to the main request. ...

### 6.2 Problem and Solution

In document B(3) a new inhibitor system is presented to the public which aims at replacing AIN used before as an inhibitor to selectively favour the growth of the correctly oriented grains. The new inhibitor system is said to allow a more economic production of high-grade electric steel sheets on a large industrial scale

than does the AIN (column 2, lines 29 to 45). Although it is the primary aim of document B(3) to obtain a material with a high magnetic induction, it is also made quite clear that this quality should go together with a low iron loss (the paragraph bridging the columns 1 and 2). Therefore the "negligence" that this document does not report any value for the iron loss of the steel sheet fabricated using this new inhibitor system is obviously due to the fact that the authors of document B(3) had not yet had the time to look at all important aspects of their new development. Starting from document B(3) as the closest prior art, one of the most urgent problems to be solved is, therefore, to optimise this known process in a manner that the final steel sheet has an iron loss which is as low as possible (less than 0.90 W/kg) without losing the high grain orientation, and hence induction, already achieved. In its method aspect according to the main request, the contested patent claims to solve this problem by the combination of the following features by which the subject-matter of Claim 2 differs from the disclosure of document B(3):

- The cold rolling is carried out so as to obtain a final gauge of from 0.15 to 0.25 mm;
- the final annealing is carried out so that the forsterite coating which is formed on the steel sheet surfaces amounts to from 1 to 4 g/m<sup>2</sup>;
- the final annealing is carried out such that the secondary crystallised grain size is from 1 to 6 mm.

The feature "that the resultant sheet has an iron loss at W17/50 of less than 0.90 W/kg" was confirmed by Appellant III (proprietor) to be the inevitable result of the other method features provided that these are carried out by a person skilled in the art using his ordinary general knowledge and skill and further being guided by the description of the patent in suit.

### 6.3 Inventive Step

When the new grain growth inhibitor system according to document B(3) had been presented to the public, the person skilled in the production of grain-oriented silicon steel sheets found himself in a position in which he had been at least twice already in the past. New methods had been developed, at least on a laboratory scale, to create silicon steel sheet with a high degree of cube-on-edge crystal orientation and hence with a high value of magnetic induction. Induced by the requirements of the users, the manufacturer of such magnetic steel sheet was inevitably confronted with the problem of minimising the iron loss of his sheets without losing the high degree of crystal orientation. Therefore, systematic tests had to be performed to find out by which parameters these qualities were affected. In 1967, the results of a classical investigation in this respect had been reported by the review document A(2), the disclosure of which is rated as part of the general knowledge in this technical field. A similar investigation was carried through, when the grain growth inhibiting properties of AIN had been detected and the new grain oriented sheet product, known under the trade name ORIENTCORE HI-B, which exhibited a still higher degree of grain orientation and hence a

higher value of magnetic induction, had been developed on this basis.

Document B(1) is the comprehensive report about these investigations disclosing the conclusions enumerated under point 5 above. The Board cannot recognise any prejudice that could have stopped a person skilled in the art, who wanted to optimise the iron loss values of the high grade magnetic steel sheets produced by using the new inhibitor system disclosed in document B(3), from repeating, at least as a first approach, the same systematic experiments which according to document B(1) - and there before according to document A(2) - had proved to be apt for finding out which parameters influenced the iron loss values of the new class of magnetic material.

Although document B(1) is quite clear in mentioning that these effects, which had been verified on a laboratory scale were hardly realisable in commercial products with sheet thicknesses of about 9 mil (0.23 mm) "from the points of both manufacture and use" (page 7, left column under Figure 11, see also document A(2), page 1108, Conclusion), this remark cannot be taken as a prejudice which was still valid at the priority date of the patent in suit Document A(4) proves that, in 1979, methods had been developed which allowed the production of 0.225 mm thick high-grade silicon sheets having an iron loss of less than 0.90 watt/kg.

Consequently, the subject-matter of the method Claim 2 according to the main request is to be considered as the inevitable technical conclusion to be drawn from the results of the sequence of tests the performance of which is obvious when applying the experiments disclosed in B(1) on silicon steel sheet using the inhibitor system disclosed in document B(3). In particular, the Board cannot acknowledge that the measure to form a forsterite coating in an amount of 1 to 4 g/m<sup>2</sup> per surface involves an inventive step. Forsterite is the classical main constituent of the glass coatings formed from the separator composition during the final annealing. The Board is in agreement with all the parties that forsterite is also formed when carrying out the method disclosed in document B(3) (column 10, lines 30 to 45). The patent in suit (page 3, lines 11 to 13) states that a minimum of 1 g/m<sup>2</sup> forsterite is indispensable to maintain the insulation and to obtain a good face coating. It would not be comprehensible why the skilled person should use another composition and quantity for the glass coating when already the routine coating proves to apply a tensile stress to the sheet surface which suffices to minimise the iron loss value. In summary, the Board, therefore, reaches the conclusion that the subject-matter of Claim 2 according to the main request can be deduced from the prior art in an obvious manner and thus does not involve an inventive step within the meaning of Article 56 EPC.

6.4 The method according to Claim 2 of the main request, when carried out by a person skilled in the art, results in products which meet the features of the product Claim 1 according to the main request.

Following the considerations under point 5 above, the respective Claim 1 does not involve an inventive step either. The main request is therefore not allowable.

[...]

9. In summary, the Board comes to the conclusion that all the requests lack at least one of the requirements for a patentable invention according to Article 52(1) EPC.

**Order**

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

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