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**Datasheet for the decision
of 13 April 2021**

Case Number: T 0366/19 - 3.3.05

Application Number: 12831286.5

Publication Number: 2757169

IPC: C22C38/00, B21B1/22, B21B3/00,
C21D9/46, C22C38/04, C22C38/58,
C23C2/02, C23C2/06, C23C2/28

Language of the proceedings: EN

Title of invention:
HIGH-STRENGTH STEEL SHEET HAVING EXCELLENT WORKABILITY AND
METHOD FOR PRODUCING SAME

Patent Proprietor:
JFE Steel Corporation

Opponent:
ArcelorMittal

Headword:
High-strength formable steel/JFE

Relevant legal provisions:
EPC Art. 114(2), 100(b), 100(a), 54, 56

Keyword:

Late submitted material - evidence not admitted by opposition
division

Sufficiency of disclosure (yes)

Novelty - (yes)

Inventive step - (yes)

Decisions cited:

T 0047/14, T 0820/14, T 0945/12, T 0971/11, T 1811/13,
T 0291/15

Catchword:



Beschwerdekammern

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Case Number: T 0366/19 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 13 April 2021

Appellant: ArcelorMittal
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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 27 November
2018 rejecting the opposition filed against
European patent No. 2757169 pursuant to Article
101(2) EPC.**

Composition of the Board:

Chairman E. Bendl
Members: S. Besselmann
S. Fernández de Córdoba

Summary of Facts and Submissions

- I. This appeal lies from the opposition division's decision to reject the opposition against European patent No. 2 757 169 B1. The patent in suit concerns a high-strength steel sheet having excellent workability and a method for producing it.
- II. The independent claims of the patent as granted relate to a method for manufacturing a high-strength steel sheet having excellent formability (claim 1) and a high-strength steel sheet having excellent formability (claim 4) and read as follows.

Claim 1:

"A method for manufacturing a high strength steel sheet having excellent formability, the method comprising hot-rolling a steel slab having a chemical composition containing, by mass%,

C: 0.03% or more and 0.35% or less,

Si: 0.5% or more and 3.0% or less,

Mn: 3.5% or more and 10.0% or less,

P: 0.1% or less, S: 0.01% or less,

N: 0.008% or less,

optionally Al: 0.01% or more and 2.5% or less,

optionally at least one chemical element selected from

Cr: 0.05% or more and 1.0% or less, V: 0.005% or more

and 0.5% or less, Mo: 0.005% or more and 0.5% or less,

Ni: 0.05% or more and 1.0% or less, and Cu: 0.05% or

more and 1.0% or less,

optionally at least one chemical element selected from

Ti: 0.01% or more and 0.1% or less, Nb: 0.01% or more

and 0.1% or less, and B: 0.0003% or more and 0.0050% or

less,

optionally at least one chemical element selected from Ca: 0.001% or more and 0.005% or less and REM: 0.001% or more and 0.005% or less, optionally Mg: 0.0005% or more and 0.0100% or less, optionally Ta: 0.0010% or more and 0.1000% or less, optionally Sn: 0.0020% or more and 0.2000% or less and/or Sb: 0.0020% or more and 0.2000% or less, and the balance comprising Fe and inevitable impurities,

coiling the hot - rolled steel sheet at a temperature range of the Ar_1 transformation point to the Ar_1 transformation point + (the Ar_3 transformation point - the Ar_1 transformation point) / 2 ,

optionally holding the coiled steel sheet at a temperature range of the Ar_1 transformation point to the Ar_1 transformation point + (the Ar_3 transformation point - the Ar_1 transformation point) / 2 for 5 hours or more,

cooling the coiled steel sheet down to 200°C or lower, heating and holding the cooled steel sheet at a temperature range of the Ac_1 transformation point-200°C to the Ac_1 transformation point for 30 minutes or more, pickling the heated steel sheet, cold-rolling the pickled steel sheet under the condition that the rolling reduction is 20% or more,

heating and holding the cold - rolled steel sheet at a temperature range of the Ac_1 transformation point to the Ac_1 transformation point + (the Ac_3 transformation point - the Ac_1 transformation point) / 2 for 30 seconds or more, and

optionally cooling the heated steel sheet down to a temperature of 200 °C or lower and heating and holding

the cooled steel sheet at a temperature range of the Ac_1 transformation point to the Ac_1 transformation point + (the Ac_3 transformation point - the Ac_1 transformation point) / 2 for 10 seconds or more."

Claim 4:

"A high strength steel sheet having excellent formability, the steel sheet having a chemical composition containing, by mass%,

C: 0.03% or more and 0.35% or less,

Si: 0.5% or more and 3.0% or less,

Mn: 3.5% or more and 10.0% or less,

P: 0.1% or less,

S: 0.01% or less,

N: 0.008% or less,

optionally Al: 0.01% or more and 2.5% or less,

optionally at least one chemical element selected from

Cr: 0.05% or more and 1.0% or less, V: 0.005% or more and 0.5% or less, Mo: 0.005% or more and 0.5% or less,

Ni: 0.05% or more and 1.0% or less, and Cu: 0.05% or more and 1.0% or less,

optionally at least one chemical element selected from

Ti: 0.01% or more and 0.1% or less, Nb: 0.01% or more

and 0.1% or less, and B: 0.0003% or more and 0.0050% or less,

optionally at least one chemical element selected from

Ca: 0.001% or more and 0.005% or less and REM: 0.001% or more and 0.005% or less,

optionally Mg: 0.0005% or more and 0.0100% or less,

optionally Ta: 0.0010% or more and 0.1000% or less,

optionally Sn: 0.0020% or more and 0.2000% or less

and/or Sb: 0.0020% or more and 0.2000% or less, and

the balance comprising Fe and inevitable impurities and

a microstructure including, in terms of area fraction,

30.0% or more of ferrite, wherein the ratio of the

amount of Mn (mass%) in the ferrite divided by the amount of Mn (mass%) in the steel sheet is 0.80 or less, and, in terms of volume fraction, 10.0% or more of retained austenite, wherein the amount of Mn in the retained austenite is 6.0 mass% or more, and in which the average grain size of the retained austenite is 2.0 μm or less."

Claims 2, 3 and 5 relate to preferred embodiments of these independent claims.

III. The following documents are relevant to the decision.

- D1bis EP 2 703 512 A1 (JFE STEEL CORP [JP])
5 March 2014
- D2 US 2011/0083774 A1 (JIN YOUNG HOON [KR] ET AL)
14 April 2011
- D3 DE MOOR E et al.: "Austenite stabilization through manganese enrichment",
Scripta Materialia, Elsevier, Amsterdam, NL,
vol. 64, no. 2, pages 185-188, 2011
- D4 CN 102 021 472 A (CENTRAL IRON & STEEL RES INST [CN]) 20 April 2011
and a human translation and a machine translation of it
- D5 JP 2008 291304 A (JFE STEEL KK) 4 December 2008
and a machine translation of it

IV. The opponent (appellant), in its statement of grounds of appeal, held that the documents D1bis and D2-D5 should be considered in the appeal proceedings and raised objections under Article 100(b) EPC and Article 100(a) in conjunction with Articles 54 and 56 EPC.

With its statement of grounds of appeal, and its further submissions of 16 December 2019, the appellant

provided graphs comparing the composition-dependent transformation points calculated for the examples of the patent with the numerical ranges disclosed in D4 (heating steps) and D2 (coiling temperature). It also compared the specific temperatures used in the examples of the patent in suit with the numerical ranges known from D2 (coiling temperature) and D4 (heating and annealing steps). In addition, it provided graphical representations of the succession of heat treatment steps defined in claim 1 and known from D2 and D4, respectively.

- V. The patent proprietor (respondent) provided counter-arguments and submitted, *inter alia*, test report II ("Effect of Mn Content on Mechanical Properties") with its reply to the statement of grounds of appeal. It held that documents D1bis, D4 and D5, which had not been admitted by the opposition division, should not be admitted in the opposition appeal proceedings either. The respondent filed fourteen auxiliary requests.
- VI. Oral proceedings were held on 13 April 2021.
- VII. The appellant's arguments, where relevant to the present decision, can be summarised as follows.

Document D4

The opposition division's finding that D4 was not *prima facie* relevant was incorrect. In particular, it was not correct that only Example 6 of D4 was relevant and that the temperature ranges were not anticipated. While Example 6 was the only example containing silicon, D4 disclosed a general composition of the steel which overlapped substantially with the one specified in the patent, including the presence of silicon. D4 also taught the same succession of heat treatments as the

patent in suit. The temperature ranges were expressed in numerical values. However, they corresponded in practice to the ranges based on the composition-dependent transformation points expressed in claim 1 at issue, as could be seen from the graphs provided.

It followed from T 47/14 that a board was open to review the opposition division's discretionary decision on a substantive basis if the resulting decision was manifestly wrong. Moreover, a board did not have the duty to uphold a proper exercise of discretion of the department of first instance (T 820/14, Reasons 9.4 and 9.5). It had to exercise its own discretion in view of new facts and submissions (T 945/12, T 971/11, T 1811/13 and T 291/15).

The respondent's interpretation of Example 6 was incorrect. The appellant's explanations regarding Example 6, set out during the oral proceedings, should be seen as a reply to the respondent's submissions. These explanations further demonstrated the relevance of D4, which should thus be admitted into the proceedings.

D4 anticipated the claimed method and steel and, alternatively - seen in conjunction with D2 - would have rendered obvious the claimed method and steel.

Sufficiency of disclosure

The invention was insufficiently disclosed. The patent claimed a manganese (Mn) content of 3.5%-10.0%, but the examples related exclusively to Mn contents between 4% and 6.12%, all within the preferred range of 3.8% to 7.0% (paragraph [0015] of the patent in suit). A higher content of manganese had a negative effect on the mechanical properties, as was also known from D2, which

related to a similar succession of heat treatment steps. It had to be concluded that the invention could not be carried out using manganese contents outside the preferred range because the claimed combination of high strength with high formability would not be obtained. This could also be derived from respondent's test report II.

The burden of proof in this respect was on the respondent. The claim defined several temperature ranges in terms of transformation points which varied in function of the composition. Thus, the appellant should not be obliged to verify the invention for all possible steel compositions. The temperature ranges applicable to the respective steel composition could not be easily determined. The formula indicated in the patent only provided an estimation, and the actual transformation points varied with the heating/cooling rate used during the measurement.

Novelty

The only objection was the one based on D4.

Inventive step

It could be taken from D2 that the technical problem posed had not been solved across the entire scope of the claim. Thus, no inventive step was present. A further objection was the one based on D4 in combination with D2.

Product claim 4

Implementing the method of claim 1 would necessarily result in a steel according to claim 4.

VIII. The appellant (opponent) requested that the decision under appeal be set aside and that the European patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed or, in the alternative, that the patent be maintained in amended form according to one of auxiliary requests 1-14 filed with the reply to the statement of grounds of appeal.

Reasons for the Decision

1. Admission of documents D1bis, D4 and D5
 - 1.1 Documents D1bis, D4 and D5 were filed by the opponent after expiry of the opposition period and on the final date for making written submissions in accordance with Rule 116 EPC.
 - 1.2 It was thus at the opposition division's discretion to admit the late-filed documents (Art. 114(2) EPC).
 - 1.3 In accordance with the settled case law, the opposition division must first examine the newly filed documents as to their relevance. Late-filed facts and evidence and supporting arguments should only exceptionally be admitted into the proceedings if, *prima facie*, there are reasons to suspect that such late-filed documents prejudice the maintenance of the European patent in suit (see Case Law of the Boards of Appeal of the EPO, 9th edition 2019, IV.C.4.5.1).
 - 1.4 According to the minutes of the oral proceedings before the opposition division, the reason for the late filing and the *prima facie* relevance of the documents were

discussed (first page of the minutes). In its decision, the opposition division set out in detail why it did not find the documents *prima facie* relevant (see the last three paragraphs on page 5 of the impugned decision regarding D1bis; page 6 and the first paragraph on page 7 regarding D4; page 7, second paragraph regarding D5). Regarding D4, it held that the opponent had not provided evidence to show that the temperatures contemplated by D4 fell within the ranges stipulated in claim 1. It also found that only Example 6 of D4 had a composition falling within the ranges given by claims 1 and 4.

- 1.5 The appellant disagreed with the opposition division's conclusion that D4 was not *prima facie* relevant and made further submissions in support of its relevance. However, it did not establish factual errors in the opposition division's assessment of D4. This case is therefore different to T 47/14 cited by the appellant.
- 1.6 The appellant made no further submissions concerning D1bis and D5; they were not used to substantiate any objection in the appeal proceedings.
- 1.7 It is established case law that a board should only overrule the way in which the opposition division exercised its discretion if the board concludes that the opposition division has done so according to the wrong principles, or without taking into account the right principles, or in an unreasonable way (see Case Law of the Boards of Appeal of the EPO, 9th edition 2019, IV.C.4.5.2).
- 1.8 As follows from the above, the opposition division exercised its discretion applying the correct principles.

1.9 The appellant also argued that the board had no duty to uphold a proper exercise of discretion of the department of first instance (T 820/14, Reasons 9.4 and 9.5). It cited several decisions in which the board exercised its own discretion in view of new facts and submissions (T 945/12, T 971/11, T 1811/13 and T 291/15).

1.10 In this case, the appellant filed new facts and submissions, namely several graphs comparing composition-dependent transformation points with the numerical ranges disclosed in D4 (point IV.).

Accordingly, in the appellant's favour, the question of whether these graphs should have been filed during the opposition proceedings is left aside, and it is assessed whether these graphs justify a reassessment of the relevance of D4.

1.11 The general succession of heat treatment steps in D4 corresponds to the one in the claim at issue. The above-mentioned graphs are, however, unsuitable for answering the decisive question raised by the opposition division, namely whether the numerical ranges of D4 anticipate the ranges in claim 1 at issue (point 1.4). In the claim, the temperature ranges are expressed in terms of the transformation points of the steel, these transformation points depending on the steel's chemical composition (paragraph [0070] of the patent in suit). For a meaningful comparison of the numerical ranges of D4 with the ranges in claim 1, it would thus have been necessary to calculate the transformation points specifically for the alloy compositions known from D4. However, in the graphs

under consideration, the transformation points of the alloys exemplified in the impugned patent are used.

- 1.12 Furthermore, during the oral proceedings before the board, the appellant was not faced with a new procedural situation that would have required reassessing the admission of D4 into the appeal proceedings. In the circumstances of this case, the fact that the respondent had made submissions concerning Example 6 of D4 (submissions of 18 February 2020) did not create such a new procedural situation.
- 1.13 In conclusion, the board has no reason to overturn the opposition division's discretionary decision to not admit documents D1bis, D4 and D5, nor to exercise its own discretion.

2. Sufficiency of disclosure

- 2.1 The objection concerns methods (claim 1) and steel sheets (claim 4) in which the manganese content lies in the higher part of the range, namely 7.0% to 10.0%. According to the appellant, the required high-strength steel with excellent formability cannot be obtained in these cases.
- 2.2 It is established case law that a successful objection of lack of sufficiency of disclosure presupposes that there are serious doubts, substantiated by verifiable facts, and that the burden of proof is on the opponent (see Case Law of the Boards of Appeal of the EPO, 9th edition 2019, II.C.9).

- 2.3 In this case, the allegation that the experiments would be cumbersome and that a large number of compositions would need to be tested to verify the invention across the whole scope of the claim constitutes no convincing reason to shift the burden of proof to the respondent.
- 2.4 There is no indication that the alloy compositions cannot be produced or subjected to the indicated process steps. The transformation points can be calculated using the formula provided in the patent in suit (paragraph [0070]). There is no proof that more precise values would be needed.
- 2.5 The examples provided in the patent in suit relate to steels having manganese contents up to 6.12 mass%. Supplementary examples including manganese contents up to 8.0 mass% were provided by the respondent with its reply to the statement of grounds of appeal (test report II).
- 2.6 A graph in test report II depicts the TS x EL value (product of tensile strength and total elongation) in function of the manganese content. It shows that the TS x EL values for 3.5 mass% Mn and 8.0 mass% Mn are lower than for intermediate manganese contents. It may thus be taken from the results that a manganese content within the preferred range is beneficial. However, this is merely what is to be expected for a preferred range (paragraph [0015] of the patent in suit). It does not as such raise doubt regarding the remainder of the range.

Moreover, even assuming that the TS x EL values would decrease further at higher manganese contents, it cannot be derived from the lack of experimental data relating to such manganese contents that the required

high-strength steel with excellent formability would not be obtained, irrespective of whether claim 1 implies at all that the strength and formability of the resulting steel sheet fall within specific ranges.

- 2.7 Document D2 is a patent application relating to a similar purpose as the patent in suit, namely the provision of steel sheets having high strength and high ductility. D2 states that a manganese content of 4.0% to 7.0% is essential for the invention of D2. This invention is different to the invention under consideration here; D2 was not cited against novelty of the claims at issue.

D2 describes disadvantages associated with higher manganese contents (paragraph [0024] of D2). However, this does not prove that manganese contents higher than 7.0% would not lead to steel sheets having high strength and excellent formability when carrying out the method steps of claim 1 at issue. By contrast, the respondent provided an example of a manganese content of 8.0%, as indicated.

- 2.8 There is, consequently, no proof that the claimed method would not lead to the required high-strength steel with excellent formability when the manganese content is higher than 7.0% or 8.0% and up to 10.0%.
- 2.9 For the same reasons, the appellant has not discharged its burden of proof that the steel sheet defined in claim 4 may not be obtained with these high manganese contents.
- 2.10 The ground for opposition according to Article 100(b) EPC consequently does not prejudice the maintenance of the patent.

3. Novelty

3.1 The objection of lack of novelty was solely based on D4. D4 was not admitted into the proceedings (see point 1.).

3.2 The ground for opposition according to Article 100(a) EPC in conjunction with Article 54 EPC does not prejudice the maintenance of the patent.

4. Inventive step

4.1 The appellant held that the claimed method steps would not provide the desired "high strength steel sheet having excellent formability". Thus, the technical problem posed was not solved across the whole scope of the claim, namely not in case of Mn contents of 7.0% to 10.0%.

4.2 Claim 1 is expressly directed to a method for manufacturing a "high strength steel sheet having excellent formability". In this case, the appellant's objection primarily relates to the question of sufficiency of disclosure. This has been addressed in the relevant context under point 2.

4.3 The appellant commented on the disclosure of D2 only in this context, namely when arguing that the claimed method did not result in the desired properties of the steel at high Mn contents (point 5.1.1 of the statement of grounds of appeal). It acknowledged that D2 did not disclose the heat treatments defined in claim 1.

However, the appellant did not set out why the claimed method would have been obvious for the skilled person.

In particular, the appellant did not deal with the opposition division's finding that the appellant's objection starting from D2 as the closest prior art was not understood because there was no reasoning why D2 was chosen as the closest prior art or whether it was to be considered alone or with D3 (opposition division's decision, last paragraph of the section "inventive step").

- 4.4 The appellant considered D4, which had not been admitted by the opposition division, the closest prior art. As indicated, D4 was not admitted into the proceedings (point 1.).
- 4.5 The appellant additionally cited D3 and D5 (D5 not having been admitted by the opposition division) in its notice of appeal but did not substantiate its objections in view of these documents.
- 4.6 For these reasons, there is no convincing objection of lack of inventive step (Article 100(a) EPC in conjunction with Article 56 EPC).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



A. Voyé

E. Bendl

Decision electronically authenticated