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**Datasheet for the decision
of 28 March 2017**

Case Number: T 2294/15 - 3.2.08

Application Number: 04746057.1

Publication Number: 1719821

IPC: C22C38/00, C22C38/14, C22C38/58

Language of the proceedings: EN

Title of invention:

STEEL PRODUCT FOR LINE PIPE EXCELLENT IN RESISTANCE TO HIC AND
LINE PIPE PRODUCED BY USING THE STEEL PRODUCT

Patent Proprietor:

Nippon Steel & Sumitomo Metal Corporation

Opponents:

ThyssenKrupp Steel Europe AG
Salzgitter Mannesmann Grobblech GmbH

Headword:

Relevant legal provisions:

EPC Art. 56
RPBA Art. 12(4)

Keyword:

Late-filed evidence
Inventive step

Decisions cited:

T 0595/90

Catchword:



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Case Number: T 2294/15 - 3.2.08

D E C I S I O N
of Technical Board of Appeal 3.2.08
of 28 March 2017

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 16 October 2015
rejecting the opposition filed against European**

patent No. 1719821 pursuant to Article 101(2)
EPC.

Composition of the Board:

Chairwoman	P. Acton
Members:	M. Alvazzi Delfrate
	I. Beckedorf

Summary of Facts and Submissions

- I. By its decision posted on 16 October 2015 the opposition division rejected the opposition against European patent No. 1 719 821.
- II. The appellant (opponent 2) lodged an appeal against this decision in the prescribed form and within the prescribed time limits.
- III. Oral proceedings before the Board of appeal were held on 28 March 2017. As announced with letter dated 11 January 2017, opponent 1 (party as of right) did not participate at the oral proceedings. For the course of the oral proceedings reference is made to the minutes.
- IV. At the end of the oral proceedings the requests were the following:

The appellant requested that the decision under appeal be set aside and that the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed (*i.e.* that the patent be maintained as granted) or, in the alternative, that in setting aside the decision under appeal the patent be maintained in amended form on the basis of auxiliary request 2 filed with letter of 27 May 2016.

- V. Claim 1 of the **main request** reads as follows:

"A steel product with high HIC resistance for use as a line pipe, comprising in mass %:

C : 0.03% to 0.15%, Si : 0.05% to 1.0%, Mn : 0.5% to 1.8%, P : 0.015% or less, S : 0.004% or less, O

(oxygen) : 0.01% or less, N : 0.007% or less, sol. Al: 0.01% to 0.1%, Ti : 0.005 to 0.024%, and Ca : 0.0003% to 0.02%, optionally comprising at least one of Cu : 0.1% to 0.4%, Ni : 0.1 % to 0.3%, Cr : 0.01 % to 1.0%, Mo : 0.01 % to 1.0%, V : 0.01% to 0.3%, B : 0.0001% to 0.001%, and Nb : 0.003% to 0.1 %, wherein the balance consists of Fe and impurities, the size of TiN inclusion in said steel product being at most 30 µm."

Claim 1 of **auxiliary request 2** differs from claim 1 of the main request by the following additional features:

"and Al-Ca-Ti-based composite inclusions being included in the steel product, and the Al-Ca-Ti-based composite inclusions consist of Al-Ca-based oxysulfide and a TiN covering the surface of the Al-Ca-based oxysulfide."

VI. The following documents played a role for the present decision:

D2: JP -A- 2-263918;

D3: Liou et al. "Roles of Microalloying Elements in Hydrogen Induced Cracking Resistant Property of HLSA Steels" Corrosion, Vol. 49, N. 5 (1993), pages 389-398;

E7: R&D kobe seiko giho 34, 2 (1984), pages 20-24 (German translation).

VII. The appellant's arguments can be summarised as follows:

Introduction of E7 into the proceedings

E7 should be introduced into the proceedings in view of its relevance.

Main request

Starting from the closest prior art D2, the problem solved by the claimed steel, by means of the small-size TiN, was to improve HIC (Hydrogen-Induced Cracking) resistance. For the solution, differences in the origin of the TiN particles were irrelevant, since what mattered was only the size of the particles.

Each of E7 and D3 taught to keep the size of the TiN particles small to improve HIC resistance.

E7 provided said teaching in the passage following Figure 7 on page 11, which disclosed that 10-micron particles were disadvantageous.

In D3 the relevant passage could be found on page 397, which related not only to the experimental alloys of this document but also to more general compositions.

Since it was known to the person skilled in the art how to control the size of TiN particles, the subject-matter of claim 1 did not involve an inventive step.

Auxiliary request 2

No objection to auxiliary request 2 was raised.

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

Introduction of E7 into the proceedings

E7 had been filed late without any good reason. Moreover, it was not *prima facie* relevant. Thus, it should not to be admitted into the proceedings. If it

were nevertheless admitted, the case should be remitted to the opposition division.

Main request

Starting from the closest prior art D2, the problem solved by the claimed steel was to improve HIC resistance. This problem was solved by limiting the maximum size of the TiN inclusions. Such inclusions were the bigger TiN regions formed during casting and subsequent cooling, as opposed to the smaller precipitates formed during hot rolling which were mentioned in D2.

Neither E7 nor D3 taught to solve the problem above by limiting the size of the TiN inclusions according to claim 1.

E7 was concerned with the precipitations of fine carbonitrides, not necessarily TiN. The fine carbonitrides were obtained by controlling the N content, while there was no teaching to control the maximum size of the TiN inclusions.

The results concerning Ti disclosed in D3 were linked to the MnS formed by the very high S content of the experimental alloys of D3. In view of these different compositions there was no reason to apply the teaching of D3 to the alloys of D2. Even if he had done so, the person skilled in the art had no reason to choose the section of D3 relating to Ti without considering the teachings in respect of the other alloying elements.

In any event, even if the person skilled in the art had envisaged obtaining a steel with small TiN inclusions as required by claim 1, he had no method available to

do so. The only method for producing the small inclusions claimed was the one disclosed for the first time in paragraph [0070] of the patent. A failure to apply the correct conditions of said method resulted in coarser inclusions, as explained in the patent. Since no prior-art method was available to obtain the claimed particles, the claimed product involved an inventive step also for this reason, in accordance with case law, e.g. T 595/90 (OJ EPO 1994, 695).

Reasons for the Decision

1. Introduction of E7 into the proceedings

- 1.1 E7 was submitted at the earliest possible stage in appeal proceedings (together with the statement of grounds). Hence, the respondent had abundant time to react to it.

Moreover, it is used to support a line of attack already used in opposition proceedings, namely lack of inventive step starting from D2. Thus it is clearly relevant to the case already presented before the opposition division.

Under these circumstances the Board decided to introduce E7 into the proceedings (Article 12(4) RPBA).

- 1.2 The respondent requested the case to be remitted to the opposition division if E7 were admitted into the proceedings, but did not provide any reason for this request. Nor could the Board see any such reason, since the mere introduction of a new document is not, as

such, a reason for remitting a case. Therefore, and also in view of the length of the proceedings to date, the Board decided to continue the proceedings taking also E7 into consideration.

2. Main request

2.1 It is common ground that D2 (see its English translation D2e) represents the closest prior art. This document undisputedly discloses a steel product with high HIC resistance for use as a line pipe (claim 1 and page 2, lines 16-18) and with a composition in mass % in the ranges foreseen by claim 1 (inventive steels 1-18 of table I). It describes (page 6, lines 2-15) the advantages of fine TiN precipitates without, however, disclosing the size of the fine precipitates.

2.2 Starting from D2 the problem addressed by the claimed steel is to improve HIC resistance (paragraph [0008]).

This problem is solved in accordance with claim 1 by "the size of TiN inclusion in said steel product being at most 30 μm ". As explained in paragraph [0016] "the size of the TiN inclusions" is the average of the ten largest TiN regions in five different SEM images. No distinction is made as to the origin of said TiN regions, in particular whether they are formed during casting or hot rolling. Hence, the claimed condition is a limitation on the size of the TiN particles, irrespective of whether they are formed during casting, hot rolling or another production step.

The claimed size selection is based on the realisation that, although Ti is important to fix N and improve toughness, the TiN particles act as initiation sites for HIC. Therefore a good compromise between toughness

and HIC resistance is obtained by keeping their size within the claimed range (paragraphs [0010], [0011] and Figure 1).

2.3 E7 relates to the influence of carbonitrides on HIC in steel. In the passage on page 11 following Figure 7, document E7 discloses that the number of 10-micron carbonitride particles grows with amounts of N not in solid solution exceeding 40 ppm and that said 10-micron particles can be starting points and part of the paths for the cracks. However, it is not clear whether this passage refers to Ti or Nb carbonitrides (see first full paragraph after Figures 3 and 4). Moreover, as apparent from the abstract, the teaching of E7 is focussed on the precipitation of fine carbonitrides, to be obtained *inter alia* by controlling the N amount, rather than on controlling of the maximum size of the TiN particles.

D3 is more relevant. It relates to the effects of microalloying elements on HIC. In the section relating to Ti (page 397, left-hand column) it discloses not only the results obtained by the experimental compositions of table 2 but also reports the results of previous studies, comprising but not limited to E7, on the effect of carbonitrides and in particular of TiN (page 397, right-hand column). It is thus clear to the reader that these results are not linked to the effects of the alloying elements tested in the experimental compositions of D3 but are in general applicable to any steel comprising TiN particles. Thus the person skilled in the art would consider applying the teaching of D3 about the TiN particles to the steels of D2 without necessarily applying at the same time the results concerning the effects of the alloying elements studied in the experimental compositions of D3.

D3 reports on page 397 that coarse TiN precipitates (about 1 micron or more) act as HIC initiation sites and that the bigger the TiN particle, the more opportunity for crack initiation. The teaching for the reader is thus that coarse TiN particles, i.e. particles above 1 micron, should be avoided. No distinction is made as to the origin of said coarse particles. Hence, the person skilled in the art is taught, in order to improve HIC resistance, to avoid particles bigger than 1 micron, independently of whether they are formed during casting and cooling or during hot rolling. Therefore, D3 teaches keeping the size of TiN inclusion in the steel product within the claimed range of at most 30 μm .

The respondent argued, referring to decision T 595/90, that in any event the subject-matter of claim 1 involved an inventive step because no method was disclosed in the prior art which made it possible to obtain the claimed product. In T 595/90 the Board took the view "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" (last paragraph of point 5 of the Reasons).

In the present case the Board is not convinced that there was no method available to the person skilled in the art to obtain the claimed TiN size. In fact, the patent in suit describes the invention as lying in the choice of the TiN size and not in the method of

obtaining said size (see paragraphs [0010] and [0011] of the B publication). It is true that according to the description, in the preferred manufacturing method described in paragraph [0070], if not all the conditions are met, TiN particles outside the claimed range may be obtained. However, the patent also describes, in paragraphs [0072] and [0073], that other methods of obtaining the claimed TiN size are equally viable. Said other methods rely on standard techniques not described in detail, such as control of the composition or the removal of coarse particles by flotation. Hence there is no evidence in the patent that the claimed TiN size was obtainable only by a method which was not available to the person skilled in the art.

Rather, the evidence on file indicates the contrary. As mentioned above, D3, which is a peer-reviewed scientific article, teaches the advantages of avoiding TiN particles coarser than 1 micron, i.e. particles well below the upper limit of 30 microns stipulated by claim 1, without mentioning any difficulty in this respect. The Board is thus satisfied that designing a method of producing a steel with TiN particles as stipulated by claim 1 did not go beyond the common general knowledge of the person skilled in the art.

Therefore, the subject-matter of claim 1 does not involve an inventive step.

3. Auxiliary request 2

The appellant did not raise any objection to auxiliary request 2.

The subject-matter of claim 1 is further distinguished over D2 by the Al-C-Ti-based composite inclusions. This feature was disclosed in the application as originally filed (see paragraph [0050] of the A-publication).

The inclusions are used to control the size of TiN and improve HIC resistance independently of the content of Ti (paragraphs [0048]-[0055] of the A-publication).

No hint is found in the prior art to use said composite inclusions for this purpose. Therefore, the subject-matter of claim 1 involves an inventive step.

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 in amended form on the basis of the following documents:

claims

1 to 4 filed as auxiliary request 2 with letter of 27 May 2016

description

pages 5, 7, 8 and 12 filed during the oral proceedings

pages 2-4, 6 and 9-11 of the patent specification

figures

1 to 5 of the patent specification.

The Registrar:

The Chairwoman:



C. Moser

P. Acton

Decision electronically authenticated