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Datasheet for the decision of 10 September 2009

Case Number: T 2034/07 - 3.2.08

Application Number: 03733478.6

Publication Number: 1514950

IPC: C22C 38/42

Language of the proceedings: EN

Title of invention:
Stainless-steel pipe for oil well and process for producing the same

Applicant:
JFE Steel Corporation

Opponent:
-

Headword:
-

Relevant legal provisions:
-

Relevant legal provisions (EPC 1973):
EPC Art. 54(1)(2)

Keyword:
"Novelty (yes) - after amendment"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 2034/07 **-** 3.2.08

D E C I S I O N
of the Technical Board of Appeal 3.2.08
of 10 September 2009

Appellant: JFE Steel Corporation
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 4 June 2007 refusing European application No. 03733478.6 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: T. Kriner
Members: R. Ries
A. Pignatelli

Summary of Facts and Submissions

I. The appellant (applicant) lodged an appeal against the decision of the examining division dated 4 June 2007 to refuse European patent application No. 03 733 478.6.

The application was refused on the sole ground that the subject matter of claim 1 of the main request and the auxiliary request then on file lacked novelty vis-à-vis the technical disclosure of document

D2: EP-A-0 649 915.

II. The applicant's notice of appeal against this decision was received at the European Patent Office on 8 August 2007 and the appeal fee was paid on the same date. The statement setting out the grounds of appeal was received on 15 October 2007.

III. Oral proceedings before the Board took place on 10 September 2009 at the end of which the appellant requested that

- the decision under appeal be set aside and
- the patent be maintained on the basis of the main request filed on 6 August 2009 or on the basis of the auxiliary request 1 or the auxiliary request 2, both submitted during the oral proceedings.

IV. Independent claims 1, 3 and 5 read as follows:

"1. A corrosion-resistant stainless steel pipe for oil country tubular goods having a steel composition comprising on a mass basis:

0.05% or less of C;
0.50% or less of Si;
0.20% to 1.80% of Mn;
0.03 or less of P;
0.005% or less of S;
14.0% to 18.0% of Cr;
5.0% to 8.0% of Ni;
1.5% to 3.5% of Mo;
0.5% to 3.5% of Cu;
0.05% or less of Al;
0.03% to 0.20% of V;
0.01% to 0.15% of N;
0.006% or less of 0, and optionally
at least one element selected from the group consisting of 0.20% or less of Nb and 0.30% or less of Ti, and/or
at least one element selected from the group consisting of 0.20% or less of Zr, 0.01% or less of B, and 3.0% or less of W, and/or
0.0005% to 0.01% of Ca,
the balance being Fe and incidental impurities, wherein the composition satisfies expressions (1) and (2):
$Cr + 0.65Ni + 0.6Mo + 0.55Cu + 20C \geq 18.5$ (1);
$Cr + Mo + 0.3Si - 43.5C - 0.4Mn - Ni - 0.3Cu - 9N \leq 11$ (2),
where Cr, Ni, Mo, Cu, C, Si, Mn, and N represent the respective contents thereof on a mass% basis, and
wherein the structure of the stainless steel pipe includes 5 to 25 percent by volume of a residual austenite phase and the balance being a martensite phase."

"3. A method for manufacturing a corrosion-resistant stainless steel pipe for oil country tubular goods comprising the steps of: forming a steel pipe from a steel pipe material having a composition; quenching the

steel pipe by heating the steel pipe to a temperature of the A_{C3} transformation point thereof or more and subsequently cooling to room temperature at air-cooling speed or more; and then tempering the steel pipe at a temperature of the A_{C1} transformation point thereof or less, wherein the composition comprises on a mass basis:
0.05% or less of C;
0.50% or less of Si;
0.20% to 1.80% of Mn;
0.03 or less of P;
0.005% or less of S;
14.0% to 18.0% of Cr:
5.0% to 8.0% of Ni;
1.5% to 3.5% of Mo;
0.5% to 3.5% of Cu;
0.05% or less of Al;
0.03% to 0.20% of V;
0.01% to 0.15% of N:
0.006% or less of 0, and optionally
at least one element selected from the group consisting of 0.20% or less of Nb and 0.30% or less of Ti, and/or
at least one element selected from the group consisting of 0.20% or less of Zr, 0.01 % or less of B, and 3.0% or less of W, and/or
0.0005% to 0.01% of Ca,
the balance being Fe and incidental impurities, wherein the composition satisfies expressions (1) and (2):
$Cr + 0.65Ni + 0.6Mo + 0.55Cu + 20C \geq 18.5$ (1);
$Cr + Mo + 0.3Si - 43.5C - 0.4Mn - Ni - 0.3Cu - 9N \leq 11$ (2),
where Cr, Ni, Mo, Cu, C, Si, Mn, and N represent the respective contents thereof on a mass% basis, and
wherein the structure of the stainless steel pipe includes 5 to 25 percent by volume of a residual

austenite phase and the balance being a martensite phase."

"5. A method for manufacturing a corrosion-resistant seamless stainless steel pipe for oil country tubular goods, comprising the steps of: forming a steel pipe from a steel pipe material having a composition by hot working; cooling the steel pipe to room temperature at air-cooling speed or more, or quenching the steel pipe by further heating to a temperature of the A_{C3} transformation point thereof or more and cooling to room temperature at air cooking (meant is obviously cooling) speed or more; and then tempering the steel pipe at a temperature of the A_{C1} transformation point thereof or less, wherein the composition comprises on a mass basis:
0.05% or less of C:
0.50% or less of Si;
0.20% to 1.80% of Mn;
0.03 or less of P:
0.005% or less of S;
14.0% to 18.0% of Cr:
5.0% to 8.0% of Ni;
1.5% to 3.5% of Mo;
0.5% to 3.5% of Cu;
0.05% or less of Al;
0.03% to 0.20% of V:
0.01% to 0.15% of N;
0.006% or less of 0, and optionally
at least one element selected from the group consisting of 0.20% or less of Nb and 0.30% or less of Ti, and/or
at least one element selected from the group consisting of 0.20% or less of Zr, 0.01% or less of B, and 3.0% or less of W, and/or

0.0005% to 0.01% of Ca,
the balance being Fe and incidental impurities, and
wherein the composition satisfies expressions (1) and (2):
$Cr + 0.65Ni + 0,6Mo + 0.55Cu + 20C \geq 18.5$ (1);
$Cr + Mo + 0.3Si - 43.5C - 0.4Mn - Ni - 0.3Cu - 9N \leq 11$ (2),
where Cr, Ni, Mo, Cu, C, Si, Mn, and N represent the respective contents thereof on a mass% basis, and
wherein the structure of the stainless steel pipe includes 5 to 25 percent by volume of a residual austenite phase and the balance being a martensite phase."

V. The appellant's arguments are summarized as follows:

Product claim 1 and also independent method claims 3 and 5 of the main request included the technical feature that the structure of the claimed stainless steel pipe was comprised of martensite and 5 to 25 vol% residual austenite phase. This feature was neither explicitly nor implicitly disclosed in document D2. The subject matter of independent claims 1, 3 and 5 was therefore novel with respect to the technical disclosure of document D2.

Reasons for the Decision

1. The appeal is admissible.

2. Amendments

The technical features set out in claim 1 of the main request result from a combination of the subject matter

disclosed in originally filed claims 1 to 5 and the limitation of the range for vanadium to 0.03 to 0.20% that finds support on page 17, second full paragraph of the application as filed.

Independent claim 3 is supported by originally filed claims 7, 8, 10, 11 and 5 and by the disclosure on page 17, second paragraph of the application as filed.

Independent claim 5 is supported by original claims 12, 13, 15, 16 and 5 in combination with the disclosure on page 17 of the application as filed.

Dependent claims 2, 4 and 6 correspond to originally filed claims 6, 9 and 14, respectively.

Hence, there are no formal objections under Article 123(2) EPC to the present claims.

3. Novelty

Like the present application, document D2 is concerned with tubular goods (pipes) for transporting crude oil and natural gas made of a high-strength high-toughness martensitic stainless steel having excellent anti-stress corrosion cracking property in an environment containing CO_2 and H_2S (see D2, page 1, lines 5 to 9 and 42 to 57). The following Table compares the composition of the martensitic steel pipe defined in claim 1 of the application and that disclosed in document D2 (see D2, in particular claims 1, 11, and page 4, line 15 to page 6, line 54):

Element	present application	Document D2
C	0.05 or less	0.06 or less
Si	0.50 or less	1.0 or less
Mn	0.20 to 1.80	2.0 or less
P	0.03 or less	0.04 or less
S	0.005 or less	0.01 or less
Cr	14.0 to 18.0	12 to 16
Ni	5.0 to 8.0	0.5 to 8.0
Mo	1.5 to 3.5	0.1 to 2.5
Cu	0.5 to 3.5	0.3 to 4.0
Al	0.05 or less	0.01 to 0.1 (*)
V	0.03 to 0.20	0.01 to 0.1 (*)
N	0.01 to 0.15	0.05 or less
O	0.006 or less	-
Nb(*)	0.20 or less	0.01 to 0.1 (*)
Ti(*)	0.30 or less	0.2 or less (*)
Zr(*)	0.20 or less	0.2 or less (*)
B (*)	0.01 or less	-
W (*)	3.0 or less	4 or less (*)
Ca(*)	0.0005 to 0.01	0.01 or less (*)
correlation rule (1)	$Cr+0.65Ni+0.6Mo+0.55Cu+20C \geq 18.5$	no correlation rule specified
correlation rule (2)	$Cr+Mo+0.3Si-43.5C-0.4Mn-Ni-0.3Cu-9N \leq 11$	no correlation rule specified
residual austenite	5 to 25 volume%	-
Fe	balance(martensite)	balance (martensite)

(*) optionally at least one of

As can be seen, an overlap exists between the composition of the claimed steel pipe and that known from document D2. Turning to the examples given in Table 1 of document D2, except for steel no. 14, none of them comprises 5.0 wt% Ni or more as required in the claimed steel composition. The composition of steel no. 14 comprises 7.21% Ni within the claimed range for nickel and also satisfies the correlation rules (1) and (2), but fails to comprise vanadium which is compulsory for the claimed steel. Moreover, the nitrogen content of 0.004% in sample 14 is outside the claimed range and the exact amount of oxygen is not specified.

More importantly, however, document D2 does not disclose the presence of 5 to 25 volume% residual austenite phase in the martensite matrix after tempering the steel pipe, as defined in claim 1 of the application. Nothing is found anywhere in document D2 indicating that the claimed martensite-austenite structure is tolerated or even aimed at after tempering. On the contrary, the passage on page 6, lines 1 to 6 in document D2 implies that the formation of austenite should be avoided and a fully martensitic structure be provided in the steel pipe. This understanding of document D2 is confirmed by the examples no. 1 to 10 in Table 1. Nitrogen, which is known as an effective element for generating austenite, is restricted in steels no. 1 to 10 to extremely low contents in the range of 20 to 42 ppm as to prevent the formation of austenite phase. By contrast, the composition of the claimed martensitic steel pipe requires a minimum content of 100 ppm (0.01wt%) nitrogen. Thus, even when working in the compositional range of overlap, the skilled person would not seriously contemplate

providing a stainless steel pipe which exhibits a martensite structure including 5 to 25 volume% residual austenite phase.

It results from the above considerations that the subject matter of product claim 1 is novel over the disclosure of document D2. Given that the stainless steel pipe per se is novel, the method of manufacturing the corrosion resistant steel pipe set out in independent claims 3 and 5 is novel as well.

4. Remittal

Since the decision of refusal was exclusively based on the ground of lack of novelty vis-à-vis the disclosure of document D2, which ground is now removed, the Board finds it appropriate to remit the case to the first instance for further prosecution.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance for further prosecution on the basis of the main request filed on 6 August 2009.

The Registrar: The Chairman:

V. Commare T. Kriner