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D E C I S I O N
of 16 January 2004

Case Number: T 0790/01 - 3.2.2

Application Number: 95913417.2

Publication Number: 0757112

IPC: C22C 38/00

Language of the proceedings: EN

Title of invention:
Two-phase stainless steel

Patentee:
SUMITOMO METAL INDUSTRIES, LTD.

Opponent:
Edelstahl Witten-Krefeld GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty of selection inventions (yes)"
"Inventive step (yes)"

Decisions cited:
T 0666/89, T 0017/85

Catchword:
-

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Case Number: T 0790/01 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 16 January 2004

Appellant: (Opponent)	Edelstahl Witten-Krefeld GmbH Auestrasse 4 D-58459 Witten (DE)
Representative:	Simons, Johannes, Dipl.-Ing. COHAUSZ & FLORACK Patent- und Rechtsanwälte Postfach 10 18 30 D-40009 Düsseldorf (DE)
Respondent: (Proprietor of the patent)	SUMITOMO METAL INDUSTRIES, LTD. 5-33, Kitahama 4-chome, Chuo-ku Osaka-shi, Osaka 541-0041 (JP)
Representative:	ter Meer, Nicolaus, Dipl.-Chem., Dr. TER MEER STEINMEISTER & PARTNER GbR Patentanwälte, Mauerkircherstrasse 45 D-81679 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted 8 May 2001 rejecting the opposition filed against European patent No. 0757112 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: W. D. Weiß
Members: R. Ries
E. J. Dufrasne

Summary of Facts and Submissions

I. European patent No. 0 757 112 was granted on 9 December 1998 on the basis of European patent application No. 95 913 417.2.

II. The granted patent was opposed by the present appellant on the ground that its subject matter lacked novelty and did not involve an inventive step with respect to the prior art.

Of the pre-published documents relied upon in the opposition proceedings, only the following have been discussed on appeal:

D2: Proceeding Int. Conference Duplex Stainless Steels 1991, Beaune, L. van Nassau et al.: "Welding Duplex and Superduplex Stainless Steels", Volume 1 pages 303 to 322, in particular point 3 and 3.5

D4: EP-A-0 566 814: Enclosure 1: Proceedings of the International Conference Duplex Stainless Steels 1991, Beaune, J. Charles: "Super Duplex Stainless Steels: Structure and Properties",

D5: JP-A-03082739 in Japanese language and

D5a: the PAJ of the patent application of D5 in English language and

D5b: the WPI abstract of D5 in English language.

The respondent (patentee) referred to document

D6: Duplex Stainless Steels 97, 5th World Conference, Table of Contents and pages 29 to 31 (published after the priority date of the patent).

III. With its decision posted on 8 January 2001 the Opposition Division held that the patent satisfied the requirements of the EPC and rejected the opposition (Article 102(2) EPC).

The independent claims 1 to 8 read as follows:

"1. A duplex stainless steel containing, by weight, Si: 2.0% or less, Mn: 2.0% or less, Cr: 22.0-24.0%, Ni: 4.5-6.5%, Mo: 4.0-4.8%, Al: 0.001-0.15% Al, N: 0.25-0.35%, 0.03% or less C, 0.05% or less P and 0.005% or less S, the balance being Fe and inevitable impurities which has an RVS value defined by equation (1) below, 7 or less, and a PREW value defined by equation (2) below, greater than 40:

$$RVS = [1.100x(\%Cr/52.0) + 9.888x(\%Mo/95.94) + 2.045x(\%W/183.85)]/1.738x(\%Ni/58.71) \quad (1)$$

$$PREW = \%Cr + 3.3x(\%Mo + 0.5x\%W) + 16x\%N \quad (2)"$$

"2. A duplex stainless steel containing, by weight, Si: 2.0% or less, Mn: 2.0% or less, Cr: 22.0-24.0%, Ni: 4.5-6.5%, Mo: 4.0-4.8%, Al: 0.001-0.15% Al, N: 0.25-0.35%, and one or two elements selected from group 1 elements listed below, 0.03% or less C, 0.05% or less P and 0.005% or less S, the balance being Fe and inevitable impurities, which has an RVS value defined by equation (1) below, 7 or less, and a PREW

value defined by equation (2) below, greater than 40:

Group 1 elements

Cu: 0.01-2.0%

W: 0.01-1.5%

$$RVS = [1.100x(\%Cr/52.0) + 9.888x(\%Mo/95.94) + 2.045x(\%W/183.85)]/1.738x(\%Ni/58.71) \quad (1)$$

$$PREW = \%Cr + 3.3x(\%Mo + 0.5x\%W) + 16x\%N \quad (2)"$$

"3. A duplex stainless steel containing, by weight, Si: 2.0% or less, Mn: 2.0% or less, Cr: 22.0-24.0%, Ni: 4.5-6.5%, Mo: 4.0-4.8%, Al: 0.001-0.15% Al, N: 0.25-0.35%, and at least one element selected from group 2 elements listed below, 0.03% or less C, 0.05% or less P and 0.005% or less S, the balance being Fe and inevitable impurities, which has an RVS value defined by equation (1) below, 7 or less, and a PREW value defined by equation (2) below, greater than 40:

Group 2 elements

V: 0.01-0.50%

Ti: 0.01-0.50%

Nb: 0.01-0.50%

$$RVS = [1.100x(\%Cr/52.0) + 9.888x(\%Mo/95.94) + 2.045x(\%W/183.85)]/1.738x(\%Ni/58.71) \quad (1)$$

$$PREW = \%Cr + 3.3x(\%Mo + 0.5x\%W) + 16x\%N \quad (2)"$$

"4. A duplex stainless steel containing, by weight, Si: 2.0% or less, Mn: 2.0% or less, Cr: 22.0-24.0%,

Ni: 4.5-6.5%, Mo: 4.0-4.8%, Al: 0.001-0.15% Al, N: 0.25-0.35%, and at least one element selected from group 3 elements listed below, 0.03% or less C, 0.05% or less P and 0.005% or less S, the balance being Fe and inevitable impurities, which has an RVS value defined by equation (1) below, 7 or less, and a PREW value defined by equation (2) below, greater than 40:

Group 3 elements

Ca: 0.0005 - 0.010%

Mg: 0.0005 - 0.010%

B: 0.0005 - 0.010 %

Zr: 0.01 - 0.50%

Y: 0.001 - 0.20%

Rare earth elements: 0.0005 -0.010%

$$RVS = [1.100x(\%Cr/52.0) + 9.888x(\%Mo/95.94) + 2.045x(\%W/183.85)]/1.738x(\%Ni/58.71) \quad (1)$$

$$PREW = \%Cr + 3.3x(\%Mo + 0.5x\%W) + 16x\%N \quad (2)"$$

"5. A duplex stainless steel containing, by weight, Si: 2.0% or less, Mn:2.0% or less, Cr: 22.0-24.0%, Ni: 4.5-6.5%, Mo: 4.0-4.8%, Al: 0.001-0.15% Al, N: 0.25-0.35%, and at least one element each selected from group 1 and 2 elements listed below, 0.03% or less C, 0.05% or less P and 0.005% or less S, the balance being Fe and inevitable impurities, which has an RVS value defined by equation (1) below, 7 or less, and a PREW value defined by equation (2) below, greater than 40:

Group 1 elements

Cu: 0.01-2.0%

W: 0.01-1.5%

Group 2 elements

V: 0.01-0.50%,

Ti: 0.01-0.50%

Nb: 0.01-0.50%

$$RVS = [1.100x(\%Cr/52.0) + 9.888x(\%Mo/95.94) + 2.045x(\%W/183.85)]/1.738x(\%Ni/58.71) \quad (1)$$

$$PREW = \%Cr + 3.3x(\%Mo + 0.5x\%W) + 16x\%N \quad (2)"$$

6. A duplex stainless steel containing, by weight, Si: 2.0% or less, Mn: 2.0% or less, Cr: 22.0-24.0%, Ni: 4.5-6.5%, Mo: 4.0-4.8%, Al: 0.001-0.15% Al, N: 0.25-0.35%, and at least one element each selected from group 1 and 3 elements listed below, 0.03% or less C, 0.05% or less P and 0.005% or less S, the balance being Fe and inevitable impurities, which has an RVS value defined by equation (1) below, 7 or less, and a PREW value defined by equation (2) below, greater than 40:

Group 1 elements

Cu: 0.01-2.0%

W: 0.01-1.5%

Group 3 elements

Ca: 0.0005 - 0.010%

Mg: 0.0005 - 0.010%

B: 0.0005 - 0.010 %

Zr: 0.01 - 0.50%

Y: 0.001 - 0.20%

Rare earth elements: 0.0005 -0.010%

$$RVS = [1.100x(\%Cr/52.0) + 9.888x(\%Mo/95.94) + 2.045x(\%W/183.85)]/1.738x(\%Ni/58.71) \quad (1)$$

PREW = %Cr + 3.3x(%Mo + 0.5x%W) + 16x%N (2)"

"7. A duplex stainless steel containing, by weight, Si: 2.0% or less, Mn: 2.0% or less, Cr: 22.0-24.0%, Ni: 4.5-6.5%, Mo: 4.0-4.8%, Al: 0.001-0.15% Al, N: 0.25-0.35%, and at least one element each selected from group 2 and 3 elements listed below, 0.03% or less C, 0.05% or less P and 0.005% or less S, the balance being Fe and inevitable impurities, which has an RVS value defined by equation (1) below, 7 or less, and a PREW value defined by equation (2) below, greater than 40:

Group 2 elements
V: 0.01-0.50%
Ti: 0.01-0.50%
Nb: 0.01-0.50%

Group 3 elements
Ca: 0.0005 - 0.010%
Mg: 0.0005 - 0.010%
B: 0.0005 - 0.010 %
Zr: 0.01 - 0.50%
Y: 0.001 - 0.20%
Rare earth elements: 0.0005 -0.010%

RVS = [1.100x(%Cr/52.0) + 9.888x(%Mo/95.94) + 2.045x(%W/183.85)]/1.738x(%Ni/58.71) (1)

PREW = %Cr + 3.3x(%Mo + 0.5x%W) + 16x%N (2)"

"8. A duplex stainless steel containing, by weight, Si: 2.0% or less, Mn: 2.0% or less, Cr: 22.0-24.0%, Ni: 4.5-6.5%, Mo: 4.0-4.8%, Al: 0.001-0.15% Al,

N: 0.25-0.35%, and at least one element each selected from group 1, 2 and 3 elements listed below, 0.03% or less C, 0.05% or less P and 0.005% or less S, the balance being Fe and inevitable impurities, which has an RVS value defined by equation (1) below, 7 or less, and a PREW value defined by equation (2) below, greater than 40:

Group 1 elements

Cu: 0.01-2.0%

W: 0.01-1.5%

Group 2 elements

V: 0.01-0.50%

Ti: 0.01-0.50%

Nb: 0.01-0.50%

Group 3 elements

Ca: 0.0005 - 0.010%

Mg: 0.0005 - 0.010%

B: 0.0005 - 0.010 %

Zr: 0.01 - 0.50%

Y: 0.001 - 0.20%

Rare earth elements: 0.0005 -0.010%

$$RVS = [1.100x(\%Cr/52.0) + 9.888x(\%Mo/95.94) + 2.045x(\%W/183.85)]/1.738x(\%Ni/58.71) \quad (1)$$

$$PREW = \%Cr + 3.3x(\%Mo + 0.5x\%W) + 16x\%N \quad (2)"$$

IV. The appellant argued as follows:

Document D5 as the most relevant prior art relates to duplex stainless steel (DSS) alloys which exhibit a good hot workability and an excellent resistance to stress corrosion cracking (SCC), pitting corrosion and to the attack by various acids which renders them suitable for the production of pipes for chemical plants and for the petrol industry. The elemental ranges of these steels overlap the corresponding ranges of the steel composition specified in the patent. Vis-à-vis the alloys given in D5, the patent defines only for Cr, Ni, Mo and N narrower quantitative ranges which, however, do not substantiate the novel selection of the claimed steels. Moreover, at least steel no. 8 of the exemplifying compositions given in Table 1 of document D5 meets all the compositional requirements by claim 8, except for the nitrogen content of 0.224% which, however, is only slightly outside the nitrogen range of 0.25 to 0.35% claimed in the patent. The composition of steel no. 8 also satisfies the PREW-, RVS- and RSCC-values defined in the patent by the equations (1) to (3). Although the nitrogen content of example 8 is lower than claimed, it comes very close to the claimed nitrogen range, so that at least the second criterion of the three criteria which have to be met for the novelty of a selection is not fulfilled. Consequently the subject matter of claim 8 is not novel vis-à-vis the teaching given in document D5.

As to inventive step, a skilled person would start from the duplex stainless steels disclosed in document D5, since these alloys already exhibit the required properties, i.e. a high hot-workability and an

excellent resistance to pitting corrosion and stress corrosion cracking (SCC). The problem to be solved by the disputed patent, therefore, resides in also improving the weldability of these steels, a property not addressed in document D5. In order to determine this particular property, the skilled person would perform weld test runs with the exemplifying alloy compositions 1 to 15 disclosed in Table 1 of document D5 and finally select that composition which shows the optimum performance in this respect. These tests would result in the finding that steel no. 8 actually exhibits the best weldability, because this example already meets the claimed formulae for RVN and RSCC which characterize the welding and corrosion behaviour of the alloys under consideration. In consequence thereof, the skilled worker would choose the composition of example 8 of D5 as the most promising springboard to further improve the welding properties of this alloy. When looking for technical help, he would realize from numerous passages of documents D2 or D4 that enhanced nitrogen contents exhibit a beneficial influence not only upon the mechanical strength and corrosion resistance, but also upon the welding behaviour and, more particularly, upon the stability of the microstructure of the heat affected zone (HAZ) in DSS steels. This means that the HAZ of DSS alloys which comprise nitrogen in amounts higher than conventional DSS is less prone to weld cracks. It has therefore been obvious for the skilled worker to increase the nitrogen content of example 8 from 0.224% to higher levels and above the limit of 0.25% N as suggested in the patent in suit. These considerations are even more valid because document D5 already provides in the DSS alloys nitrogen contents between 0.1 to 0.4% and the

examples 13, 14 in Table 1 prove that such high nitrogen contents in the alloy actually have been used. The subject matter claimed in the patent, therefore, lacks an inventive step.

V. The patentee argued as follows:

The claimed duplex stainless steel is a deliberately balanced composition of Cr, Ni, Mo and N to obtain an excellent match in the mechanical, corrosion and welding properties. In particular the composition according to claim 8 satisfies these known criteria for the presence of the novelty of a selection invention with respect to the alloys disclosed in document D5:

(a) the degree of overlap of the elemental ranges given in D5 with those claimed for Cr, Ni, Mo and N is 15%, 18%, 16% and 33%, respectively, so that the selected sub-ranges are narrow;

(b) The closest example (steel no. 8; N= 0.224%) in D5 is sufficiently far removed from the claimed range, since it is about 11% lower than the lower limit of 0.25% N. This difference in nitrogen is not merely a numerical matter but exhibits a technical effect, as is demonstrated by the comparative examples given in the patent and

(c) The claimed composition also represents a "purposive selection" because the desired match of properties is only achieved when the combined compositional requirements that nitrogen is in the range of 0.25-0.30% **and** the correlation rules for PREW and RVS are met. Hence, document D5 does not anticipate the claimed duplex stainless steel

alloys and neither do the DSS alloys disclosed in documents D2 or D4.

As to inventive step, document D5 does not address the problem of weld cracking and, consequently, there was no incentive given in this document to a skilled person as to how the generic alloy disclosed therein could be modified to achieve a high resistance to weld cracking without deteriorating the mechanical properties and the corrosion resistance. Documents D2 and D4 disclose a list of proven standard duplex stainless steel compositions which are all outside the claimed composition, but at the same time these documents warn the skilled metallurgist to modify these well balanced alloys. Neither of these documents includes the RVS formula featuring in all claims of the patent and stating that at values below 7 in combination with nitrogen between 0.25 and 0.35% the alloy's susceptibility for weld cracking is minimized. The claimed alloys therefore involve an inventive step.

Reasons for the Decision

1. The appeal is admissible.

2. The claims 1 to 8 of the main request correspond to the claims as granted. Hence there are no formal objections with respect to Article 123(2) and (3) EPC.

3. *Novelty (Article 54 EPC)*

3.1 The central plank on which the appellant has chosen to construct its case on novelty is the premise that at least the second criterion for the novelty of a selection is not fulfilled in view of the duplex steel alloy according to claim 8, given that at least one of 15 examples of the known alloy disclosed in Table 1 of document D5 just lay adjacent the claimed nitrogen range but nevertheless taught the skilled person that the whole of the range 0.1 to 0.4% N disclosed in document D5 was at his disposal. The novelty of the remaining claims was undisputed by the appellant.

3.2 The three postulates developed by the Boards of Appeal for the novelty of a selected sub-range of numerical values from a broader known range are based on the premise that novelty is an **absolute** concept. This concept originates from Article 52(1) EPC according to which patents are granted for inventions which are new, involve an inventive step and are susceptible of industrial application and not for the sole reason that they are "selections". Consequently, a fundamental difference between deciding novelty in situations of a so-called "selection" from a known range and in doing so in other situations does not exist: what has to be established in all cases is whether or not the disclosure of a prior art document is such as to make **available** to the skilled person as a technical teaching the subject matter for which protection is sought (for relevant jurisprudence see: Case Law of the Technical Boards of Appeal, 4th edition, I.C.4.2.1.). It has been noted in this context, that the term "available to the public" in Article 54(2) EPC has to be understood to go

beyond its literal and diagrammatical description and to comprise the explicit and implicit communication of technical information to the skilled reader. A restriction of the technical disclosure of a citation only to the examples or even a single example is not allowed. Rather, it is necessary to consider the whole content of technical information disclosed in the prior art document when read by a skilled person. When deciding the question of novelty, it has to be considered whether a person skilled in the art would, in the light of the technical facts at his disposal from this prior art document, have "seriously contemplated" applying the technical teaching of the prior art document in the range of overlap (cf. T 666/89, points 5 to 8 of the reasons) or - on the other hand - whether good reasons would have led him to exclude the selected range claimed in the patent when carrying out the invention disclosed in that document.

3.3 In applying these principles, it has to be evaluated which technical information is directly and unambiguously taught by document D5 to the skilled reader. So document D5 specifies relatively broad elemental ranges e.g. for Cr, Ni, Mo and N of the corrosion resistant hot-workable DSS but fails to define narrower, more preferred compositions of the alloy. Compared with the broad disclosure given in document D5, the patentee's position that the degree of overlap for Cr, Ni, Mo and N amounts to about 15%, 16%, 16% and 33%, respectively, is small and that, consequently, the selected sub-ranges are "narrow" cannot be disputed, the more so since the area of overlap is further confined to meet the correlation rules for the PREW- and RVS-values featuring in claim 8

and all other claims as well. Before the background of the specific nitrogen content, additionally meeting the RVS-condition implies that the steel is a material which, due to a small temperature difference between liquidus and solidus, is not prone to weld cracking. This quality has to be considered as additional to the mere composition.

It is evident from documents D5, D5a and D5b that the alloys proposed therein have been designed to improve essentially their hot workability and their resistance to stress cracking and pitting corrosion. Turning to the examples 1 to 15 given in the Tables 1 and 2 of D5, the person skilled in DSS technology realizes that the steel nos. 3, 5 and 11 exhibit the highest pitting index (PI) of, 40.57, 40.44 and 40.31, respectively, and the highest pitting temperature C.P.T. Bearing in mind the aim of document D5, he would estimate examples 3, 5 and 11 as representing the best mode for carrying out this invention. Moreover, the skilled person would learn from document D5, Figure 2, and the paragraph on page 3 dealing with the role of nitrogen that this alloying element cannot be added to the alloy independently, but has to be balanced with aluminium to satisfy the proviso of (%Al x %N) $\leq$ 0.0070 since, as depicted in Figure 2 of document D5, the corrosion rate ($g/m^2/hr$) increases dramatically above the threshold value of %Alx%N=0.0070. Based on these considerations and in the absence of any pointer in document D5 to the weld cracking properties, a preference to example 8 in Table 1 of D5 can only be made by hindsight knowing the solution provided by the patent at issue. The appellant has also not delivered any proof that example 8 of document D5 actually would have had the weld cracking

properties required by the patent in suit and being inherent in the material according to claim 8.

3.4 By contrast, the DSS alloys according to the patent at issue are carefully designed to optimize their weldability without impairing the corrosion resistance. More particularly, the claimed duplex steels aim at minimizing the phase transformations and precipitation of detrimental σ and χ intermetallic phases promoting cracks which decrease the corrosion resistance of the welded zone and the HAZ. To this end, the index of crack susceptibility on welding (RVS) featuring in all claims of the patent at issue and balancing the contents of Cr, Mo, W and Ni should be kept at 7 or lower. The exemplifying compositions and the welding test results given in the patent at issue demonstrate that these objects have been successfully achieved. The elemental ranges defining the claimed DSS alloy are, therefore, selected *"on purpose"*. Although the DSS alloys under consideration are generally required to be weldable when used for oil well pipes, power plants and chemical plants, document D5 is completely silent about this property. There was agreement between the parties that the Japanese text of this document is silent about the difficulties associated with welding, and no particular rules are given that have to be observed when combining the respective components of the DSS alloy, which rules would lead the skilled person to select the claimed narrow ranges for Cr, Mo, Ni etc and to shift in particular the nitrogen content of the alloy to higher amounts in the vicinity or even within the nitrogen range claimed in the patent at issue.

Even when read before a skilled person's technical background knowledge at the time of the publication date of document D5, which background is reflected by document D2, the expert would not have envisaged to design an alloy within the claimed elemental ranges. Although document D2 acknowledges on page 310, point 3.5 that nitrogen is of greatest importance to control the microstructure of DSS, the statement is combined with the warning that careful control of this element is indispensable to prevent the formation of nitrides (Cr_2N) and porosity (cf. D2, page 310 point 3.5). Moreover, the skilled person knew from Tables 1, 2 and 3 which list commercial grades and classified standard alloys that the maximum nitrogen content is dependent on the total chemical composition of the DSS alloys: in high-Cr grades comprising 25% to 26% Cr, or steels comprising very high Mn contents (5.8% Mn), the nitrogen content could amount to 0.25%, 0.28% or even 0.37%. In DSS alloys of the claimed type comprising Cr in the range of 22% to about 24% Cr the maximum limit for nitrogen is set to be 0.20% (cf. D2 e.g. Table 1, section (b): 22Cr duplex stainless steels; Table 2, S31803, S32304). Before this background, the nitrogen content of steel 8 (0.224% N) in Table 1 of document D5 has to be assessed as being the maximum tolerable limit for that element and, consequently, this example did not teach the skilled person that it was possible to work in the whole nitrogen range disclosed in D5 with the claimed chromium content (cf. T 17/85, point 7.4 of the reasons). On the contrary, a skilled person having regard to his technical background knowledge would have excluded such high nitrogen levels in 22-24% Cr DSS alloys. Contrary to the appellant's position, a skilled person, therefore,

would not have seriously contemplated selecting sample 8 in Table 1 of document D5 or selecting the specific type of alloy claimed in the patent from the broad ranges specified in document D5 when looking for a DSS alloy composition exhibiting an improved weldability.

3.5 Accordingly, the Board finds that the disclosure of document D5 does not make available to the public the composition of the weldable alloy defined in claim 8 of the patent at issue. Given also that none of the remaining documents D2 and D4 anticipate all the technical features claimed in the patent, the subject matter of claim 8 and, undisputedly, of claims 1 to 7 and 9 is novel.

4. *The closest prior art; inventive step*

4.1 The appellant developed arguments that, starting from document D5 as closest prior art and faced with the problem of improving the weldability of duplex stainless steels, the metallurgist would perform routine weld test runs with the steels defined by the elemental ranges in D5 and then would further improve weld performance by increasing the nitrogen content of these alloys.

4.2 The Board could, however, not agree with the appellant's position for several reasons.

4.2.1 The jurisprudence of the Boards of Appeal (cf. Case Law of the Boards of Appeal, 4th edition, 2001, pages 102 to 105, section 3) has developed certain criteria for determining the prior art which is closest to the

claimed invention and which therefore represents the most promising springboard for its development. In particular, that disclosure qualifies as the closest prior art which relates to the same or at least to a similar purpose (or objective) as the claimed invention and has the most technical features in common. It follows that a prior art disclosure not mentioning a technical problem which is at least related to the one derivable from the patent specification under examination does not normally qualify as the closest prior art, notwithstanding the quantity of technical features it may have in common with the claimed subject matter. It goes without saying that the term "problem" as it is used in this context relates to a problem to which a solution is provided by the claimed invention.

4.2.2 In the present case the problem the invention in the first place sets out to solve is the provision of a duplex stainless steel alloy that is designed to exhibit an improved **weldability**, which means in particular that the alloy composition results in an improved resistance to stress corrosion cracking **of the weld zones** allowing higher pressures of the working fluid in oil well pipes (cf. the patent specification, page 3, lines 21 to 52).

4.2.3 The parties were in agreement that document D5 (and the abstracts D5a and D5b in English language) which was considered as closest prior art in the decision under appeal and by the appellant, does not even remotely address any of the serious metallurgical problems which are encountered in the weld zone and the adjacent heat affected zone (HAZ) and which are mentioned in detail in the claimed patent. Instead this document is

concerned with improving the resistance to SCC and pitting of the base material. In view of the above mentioned principles document D5, therefore, could not represent the most promising springboard since no incentive can be gained from D5 by the skilled person with regard to the achievement of the objectives of the patent in suit and for the same reasons, it is inconclusive to single out and resort to steel no. 8 in Table 1 of D5 as the most promising springboard, as suggested by the appellant.

4.2.4 The technical teaching given in documents D2 or D4, by contrast, deal with the corrosion resistance and, more particularly, with the weldability and the possible variations of the alloy composition including the level of nitrogen. They are, therefore, much closer to the claimed subject matter (cf. D2, Tables 1 and 2; page 306, point 3: Welding metallurgy; point 4.2: Welding Consumables, Filler materials; D4, page 48, point 3: Microstructure; page 84, point 8: Intergranular corrosion in welded joints). Although a continuous improvement in weldability of duplex stainless steels due to increased nitrogen contents is already acknowledged in documents D2 and D4 (cf. e.g. D4, page 10, points 4 and 5), they also note that the nitrogen content of DSS alloys is adjusted as a function of the chromium and molybdenum additions since the solubility of N is increased by these two elements (cf. D4, page 24, lines 20 to 23). It, therefore, follows that super duplex stainless steel comprising about 25% Cr, and high amounts of Ni and Mo could include nitrogen up to 0.30%, whereas in the lower grades comprising 22% or 23% Cr and further amounts of Ni and Mo, the maximum limit for nitrogen is lower

than 0.20% (cf. D4, Tables I to III on pages 8 to 10; page 11, points 1 to 3; page 60, lines 40 to 44). It is further observed that the chemical compositions of the standard alloys listed in Tables I to III on pages 8 to 10 of D4 are carefully balanced to guarantee the desired corrosion, mechanical, welding and physical properties which make them suitable for construction materials for general and specific purposes. Given this situation, a skilled person would not deviate from these standard alloys without need, the more so since slight modifications of the composition run the risk of resulting in an unpredictable change in the properties due to the interaction of the individual elements (cf. D4, page 42, point 7, page 43, second and fourth paragraph).

5. In view of these considerations, it was neither obvious from document D5 alone nor by combining it with the teaching given in any of documents D4 or D2 to design the duplex stainless steel alloy composition according to claims 1 to 9 of the patent.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

V. Commare W. D. Weiß

R.
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