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D E C I S I O N
of 8 November 2005

Case Number: T 0266/04 - 3.2.06

Application Number: 97940355.7

Publication Number: 0867256

IPC: B23K 35/368

Language of the proceedings: EN

Title of invention:
Welding material for stainless steels

Patentee:
SUMITOMO METAL INDUSTRIES, LTD.

Opponent:
The Lincoln Electric Company

Headword:

-

Relevant legal provisions:
EPC Art. 54, 56

Keyword:
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:

-

Catchword:

-

Case Number: T 0266/04 - 3.2.06

DECISION
of the Technical Board of Appeal 3.2.06
of 8 November 2005

Appellant: The Lincoln Electric Company
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 22 December 2003
rejecting the opposition filed against European
patent No. 0867256 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: P. Alting van Geusau
Members: G. De Crignis
R. Menapace

Summary of Facts and Submissions

I. The mention of the grant of European patent No. 0 867 256 in respect of European patent application No. 97 940 355.7 claiming a JP-priority from 13 September 1996 was published on 19 December 2001.

Claim 1 reads as follows:

"A composite wire type welding material for use in welding stainless steels, composed of a steel shell and a filler material enveloped by the said steel shell and not containing slag forming agent, wherein:

said welding material, as a whole of the steel shell and filler material enveloped therein, consist of not more than 0.03 % C, not more than 1.0 % Si, not more than 1.5 % Mn, not more than 0.04 % P, not more than 0.01 % S, not more than 0.5 % Al, 8.0 to 10.0 % Ni, 22.0 to 26.0 % Cr, 2.0 to 5.0 % Mo, 0.12 to 0.24 % N, not more than 3.0 % Co, not more than 5.0 % W, not more than 2.0 % Cu, not more than 1.50 % V and the balance being Fe and incidental impurities;

pitting resistance equivalent PREW of the said welding material is not smaller than 42.0 and ferrite volume index Ph of the said welding material is 0.12 to 0.25, in which PREW and Ph are defined by the following formula (1) and formula (2) respectively:

$$\text{PREW} = \text{Cr} + 3.3 (\text{Mo} + 0.5\text{W}) + 16 \text{N} \tag{1}$$

$$\text{Ph} = \frac{\text{Ni} + 30 (\text{C} + \text{N}) - 0.6 (\text{Cr} + 1.5 \text{Si} + \text{Mo} + 0.4 \text{W}) + 5.6}{\text{Cr} + 1.5 \text{Si} + \text{Mo} + 0.4 \text{W} - 6} \tag{2}$$

wherein each symbol of an element indicates the content (weight %) of the element."

II. Notice of opposition was filed on 19 September 2002 by the Appellant (Opponent) on the grounds of Article 100(a) EPC.

III. By decision of the opposition division posted on 22 December 2003 the opposition was rejected. The opposition division was of the opinion that the subject-matter of claim 1 complied with the requirements of the EPC. In particular, the subject-matter of claim 1 was novel and inventive when compared with the prior art disclosed by the documents:

D1 US-A-4 816 085

D2 US-A-5 298 093

D3 EP-A-0 727 503

D4 "Effect of welding techniques on the properties of super duplex stainless steels", J.J. K. Stekly et al., Duplex Stainless Steels, Vol. 1, 1991, p. 431 - 439.

IV. On 20 February 2004 notice of appeal was filed against this decision by the appellant (opponent) together with a payment order for the appeal fee. The statement of the grounds of appeal was filed on 25 March 2004. The objections under Article 100(a) EPC were maintained and two new documents

D5 JP-A-62-286676 and

D6 JP-A-62-286677

were submitted, both in the form of the Japanese documents together with an English abstract.

V. In a communication pursuant to Article 11(1) of the Rules of Procedure of the Boards of Appeal dated 21 April 2005 and sent together with the summons to oral proceedings, the Board pointed to the fact that in D1 which was cited with respect to lack of novelty, no composite welding wire material was clearly and unambiguously disclosed and that in respect of inventive step, *inter alia* the suitability of the welding material for TIG and MIG welding processes should be considered.

VI. Oral proceedings were held on 8 November 2005.

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

The Respondent (patentee) requested that the appeal be dismissed and that the patent be maintained as granted.

VII. In support of his request the appellant essentially relied upon the following submissions:

D1 disclosed the subject-matter defined in claim 1. In particular it disclosed a duplex stainless steel wire for welding purposes. In column 2, lines 14 to 18 it referred to alloys in the form of welding filler materials and to wires, bars, plates, tubes, pipes, billets and forgings. Also composite wire type welding material as claimed in the patent in suit was implied by this list. Tables 1 and 2 of D1 disclosed various ranges for the composition of the alloys which allowed that the composition of an individual alloy could be chosen such as to fall within the ranges as claimed in the patent in suit. These chosen compositions

accordingly led implicitly to the claimed values for the PREW and Ph, as shown by the calculations filed with the written submissions. Therefore, the subject-matter of claim 1 lacked novelty.

D5 and D6 should be admitted since the compositions disclosed therein for the alloy were closer to the compositions claimed than the compositions disclosed in JP-A-8260101. This applied particularly with respect to the ranges disclosed for Ni and N which were particularly relevant for the calculation of the Ph and PREW values.

Considering inventive step, the closest prior art was represented either by JP-A-8260101 which was referenced as such in the patent in suit (paragraph 0007) or by D5.

Starting from JP-A-8260101, both the definition and relevance of the PREW and the Ph value was already indicated. With respect to the composition, the Ni and N content had to be changed in the direction shown in D5/D6. However, no surprising effect for the changed Ni and N content has been demonstrated. Therefore, no inventive activity should be conceded.

Starting from D5, which disclosed a welding method for two-phase stainless steel products using a welding core wire with a general composition with in particular Ni and N contents very near to the claimed composition. The skilled person was aware that this welding filler material could be used for improving pitting resistance of the weld zone of two-phase stainless steel products. In addition, D1 also referred to an alloy composition of duplex stainless steel and the applicability of

welding filler materials in the gas tungsten arc welding process and indicated their corrosion resistance. The skilled person would combine the disclosure of these two documents in order to improve pitting resistance further. The definitions of PREW and Ph were well-known to the skilled person as demonstrated by JP-A-8260101. Also in this case no inventive activity was present.

With respect to the feature that the welding material was composed of a filler material enveloped by a steel shell, this feature represented a usual and well-known form also in view of its simplicity of manufacturing. This feature being independent from the composition could not, therefore, support inventive step.

VIII. The respondent essentially relied upon the following submissions:

The subject-matter of claim 1 was novel over D1 already for the reason that it lacked a disclosure of a composite welding wire. Furthermore, the composition of the alloy of D1 was different with respect to a broader range in respect of Ni, and modified ranges in respect of Cr and N and narrower ranges in respect of Mo and W. PREW and Ph values and the basis for their calculation were not mentioned at all.

Late filed D5 and D6 should not be admitted for lack of relevance since D5 and D6 disclosed circumstances of use which were not related to the use in both the MIG as well as the TIG processes.

In any event, the subject-matter of claim 1 involved an inventive step over the combination of the teachings of either JP-A-8260101 with D5 (or D6) or the combination of the teachings of D5 with D1.

The technical problem was the selection of a suitable welding composition for super duplex stainless steel in MIG and TIG processes in order to avoid pitting corrosion, and allow an easy manufacturing of the welding material. None of the available documents pointed to this problem or provided a solution suggesting the combination of features of claim 1 of the patent in suit. Hence, the skilled person was not led to choose a welding material with such characteristics.

Reasons for the Decision

1. The appeal is admissible.
2. *Late filed documents D5 and D6*

D5 and D6 are Japanese documents which were submitted together with an English abstract. Not having provided a translation, the appellant relied upon the content of the abstract only, which therefore forms the basis of the following considerations.

The English abstracts refer to welding methods for two-phase stainless steel products. A welding core wire and its composition is disclosed and a figure shows the welding process using an electrode 5 and a core wire 4. Two formulas different from the formulas for PREW and

Ph values as claimed are indicated but no explanations with respect to these formulas or their use are given. The composition of the core wire 4 is similar to the one claimed in the patent in suit. Moreover, both D5 and D6 disclose a composition of the core wire comprising 6 to 12 % Ni and 0,08 to 0.3 % N (D5) respectively 0.13 - 0.3 % N (D6) which is closer to the ranges claimed than the ranges given for these elements in JP-A-8260101 as acknowledged in paragraph (0007) of the patent in suit.

In view of the ranges disclosed for Ni and N - both elements strongly influencing pitting corrosion and blowhole formation in welding - these documents are considered of sufficient relevance for consideration in respect of inventive step of the claimed subject-matter. Therefore, they are admitted into the proceedings.

3. *Novelty*

3.1 The appellant argued that D1 at least implicitly disclosed a welding wire comprising a steel shell and a filler material enveloped by the steel shell having the composition as claimed and leading to PREW and Ph values falling within the claimed ranges.

3.2 In column 2, lines 14 to 18 of the description, D1 refers to an alloy having a composition as described in table 1. This alloy may be produced in various forms. One form mentioned refers to welding filler material. Other forms mentioned refer to wire, bar, plate, tube, pipe etc.. This disclosure cannot be construed to mean, as contended by the appellant, that the welding filler material may be produced in any of the forms of the

other commercial products of the alloy. Therefore, even if it may be true that composite welding wire is a well-known form of welding filler material, no clear and unambiguous disclosure of this form of welding filler material is derivable from D1. Therefore, the opposition division's conclusion that no composite welding wire is clearly and unambiguously disclosed in D1 is well-founded.

3.3 Furthermore, as was also pointed out by the opposition division, D1 discloses in table 1 only alloy compositions in accordance with a broad range of elements, a narrow range and one typical alloy. Since the typical alloy, while comprising elements falling within the ranges claimed does not meet the requirement of a PREW value of 42 or higher, any selection from either the broad or narrow range to meet this requirement amounts to a purposive selection not disclosed in D1. Also for this reason the subject-matter of claim 1 is novel over that disclosed in D1.

3.4 Since D5 or D6 at least lack any disclosure of an alloy having a composition leading to the PREW and Ph values claimed, JP-A-8260101 cited in the description of the patent in suit requires different Ph values and none of the other documents comes closer, the subject-matter of claim 1 of the patent in suit is novel.

4. *Inventive step*

4.1 The opposition division considered JP-A-8260101 to represent the closest prior art. This document referred to in the patent in suit (paragraph 0007) is concerned with the welding of super duplex stainless steel and

with improving the pitting corrosion resistance and toughness of the weld metal section. The abstract of JP-A-8260101 cited in the patent in suit refers to welding materials of a specified composition with a PREW of • 42 and a Ph of 0.25 to 0.35 and to the TIG welding of duplex stainless steel (Figure 1). Therefore, having regard to the composition and the identical formulas for the PREW and Ph values, also the Board considers that JP-A-8260101 forms the closest state of the art.

4.2 The subject-matter of claim 1 of the patent in suit differs from what is known from the abstract of JP-A-8260101 essentially in the composition of the welding material with respect to

- Ni (8.0 to 10.0 % instead of 2.0 - 8.0 %),
- N (0.12 to 0.24 % instead of 0.24 to 0.35 %)
- the Ph value (0.12 to 0.25 instead of 0.25 to 0.35)

and in that the welding material is in the form of a steel shell and a filler material enveloped by said steel shell. Furthermore, the ranges or values, respectively chosen in the composition of the alloy for S, Cr, Mo, Al and Co are different.

4.3 The problem to be solved starting from JP-A-8260101 as indicated in the patent in suit (see paragraphs 0008 to 0010 and 0016) relates to providing a welding material which should be applicable to both methods, TIG (tungsten inert gas welding) as well as to MIG (metal inert gas welding). Furthermore, the properties of corrosion resistance, tensile strength and toughness should be improved and an easy manufacturing method

should be possible. These objectives are achieved by the claimed composite wire type welding material.

4.4 In none of the cited documents could the skilled person facing these problems find a pointer to a possible solution, as already correctly held by the opposition division starting from JP-A-8260101 in respect of the disclosure of D1 to D4.

4.5 As regards the appellant's arguments

that a filler material with a steel shell was the usual form in which welding materials are used and that the manufacturing of a sheath with a powder core was cheap to produce and, therefore, evidently advantageous,

that the solution as claimed was obvious when starting from the disclosure of JP-A-8260101 and combining it with knowledge derivable from either document D5 or D6,

and that the solution was also obvious when starting from the disclosure of D5 and combining it with that of D1,

the Board observes the following:

4.5.1 Although stating that the welding material was composed usually of a steel shell and a filler material enveloped by the steel shell, the appellant failed to provide any evidence for such allegation. JP-A-8260101 discloses a solid wire and the appellant admitted that also D5 and D6 did not explicitly disclose such form of a welding material.

- 4.5.2 Referring to the argument that the solution was obvious either when starting from the disclosure of JP-A-8260101 and combining it with teaching derivable from document D5/D6 or when starting from the disclosure of D5 and combining it with the teaching of document D1, there is no indication to be found in any of these cited documents that the skilled person would try to optimize the material composition and its form in order to allow for application in TIG as well as in MIG welding.
- 4.5.3 Furthermore, there is no indication to be found in any of these documents that the skilled person would change the Ph value as suggested in JP-A-8260101 (Ph of 0.25 to 0.35). Neither D5/D6 nor D1 suggest any value or range for Ph. Therefore, a low range of Ph of 0.12 to 0.25 as claimed in the patent in suit is not rendered obvious. According to the patent in suit, col. 4, l. 50 - 53, the reduction of the pitting corrosion resistance in the austenitic phase, due to the restriction of the nitrogen content, is compensated by setting the ferrite volume index Ph at a lower level than usual. Therefore, the range of Ph has to be considered in combination with the nitrogen content. The range for N disclosed in JP-A-8260101 (0.24 to 0.35 %) is above the claimed range (0.12 - 0.24 %) and in D1 and D5/D6 it extends beyond it (up to 0.30 %). In this context, the allegation of the appellant that the choice of the range for N and Ni would not result in any effect is not convincing since N and Ni are combined with the ferrite volume index in a range completely different from what was known before.

4.5.4 With respect to the Ni content it is emphasized that for calculating the ferrite volume index Ph, said content also plays a major role. The range for Ni disclosed in JP-A-8260101 (2,0 to 8.0 %) is below the claimed range (8.0 to 10.0 %) and in D1 and D5/D6 it extends beyond it (up to 13.0 % respectively 12.0 %). No reason is derivable from any cited document why the skilled person should limit the range in the way as claimed.

4.6 Summing up, in whichever way all these documents are combined, the skilled person did not get a suggestion to lower the range of Ph, to adapt the ranges and values to this purpose and, thus, would not have arrived at the subject-matter claimed and achieved the desired result of applicability in both, MIG and TIG processes together with a particular form of the welding material.

4.7 Therefore, the subject-matter of claim 1 involves an inventive step within the meaning of Article 56 EPC. The same is true in respect of the subject-matter of dependent claims 2 to 5. In conclusion, the grounds of opposition under Article 100(a) EPC do not prejudice the maintenance of the patent as granted.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

M. Patin

P. Alting van Geusau