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D E C I S I O N
of 24 November 2005

Case Number: T 0202/03 - 3.2.06

Application Number: 97105268.3

Publication Number: 0798070

IPC: B23K 35/368

Language of the proceedings: EN

Title of invention:
Flux cored wire electrode for arc welding

Patentee:
KABUSHIKI KAISHA KOBE SEIKO SHO

Opponent:
L'AIR LIQUIDE, S.A.

Headword:
-

Relevant legal provisions:
EPC Art. 123(2), 84, 56
EPC R. 57a

Keyword:
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0202/03 **-** 3.2.06

D E C I S I O N
of the Technical Board of Appeal 3.2.06
of 24 November 2005

Appellant: (Opponent)
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Decision under appeal:
Interlocutory decision of the Opposition Division of the European Patent Office posted 16 January 2003 concerning maintenance of the European patent No. 0798070 in amended form.

Composition of the Board:

Chairman: P. Alting van Geusau
Members: G. L. De Crignis
J. Van Moer

Summary of Facts and Submissions

I. European patent No. 0 798 070 granted on application No. 97 105 268.3 was maintained in amended form by decision of the opposition division posted on 16 January 2003.

Claim 1 as maintained by the opposition division reads as follows:

"A flux cored wire electrode for arc welding, comprising a flux filled in the steel housing, wherein the contents of TiO_2, Ti, Mg, Al, B, Mn, Si, K, and Na are at least 3.0 to 10.0 % by weight, 2 to 8 % by weight, 0.1 to 0.8 % by weight, ≤ 0.5 % by weight, 0.001 to 0.03 % by weight, 1.0 to 4.0 % by weight, 0.5 to 3.0 % by weight, 0.001 to 0.5 % by weight and 0.001 to 0.5 % by weight, respectively, to the total weight of the wire electrode, satisfy the formula:

$$1.0 \leq (Mg + 100 \times B + 0.1 \times Ti + 0.1 \times Mn + K + Na)/Si \leq 3.0$$

the contents of Ti, Mg, Al, B, Mn, Si, K and Na being expressed as total element included in the corresponding metal, alloy and compounds."

The opposition division was of the opinion that the subject-matter of claims 1 to 3 in accordance with the patent proprietor's request filed on 8 November 2002 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-4 465 921

D4: JP-A-56 095495

D5: JP-A-3 275295

D6: JP-A-1 284497

D9: US-A-5 233 160.

II. The appellant (opponent) filed a notice of appeal against this decision and paid the appeal fee, both on 20 January 2003. The statement of grounds of appeal was filed on 5 February 2003. The appellant submitted that the claimed subject-matter lacked inventiveness and that the patent should therefore be revoked. Moreover the amended description did not comply with the requirements of the EPC. In this respect the amendments carried out to the examples gave rise to two fundamental questions to be presented to the Enlarged Board of Appeal.

III. In a communication accompanying the summons to oral proceedings pursuant to Article 11(1) Rules of Procedure of the Boards of Appeal, the Board indicated that the introduction of an additional dependent claim (claim 2) was not occasioned by grounds for opposition specified in Article 100 EPC as required by Rule 57a EPC. The Board further referred to Article 112(1) and (1)(a) EPC according to which a question to the Enlarged Board of Appeal was admissible only if an important point of law was concerned or non-uniform application of the law should be rectified which conditions did not appear to be the case.

IV. Oral proceedings were held on 24 November 2005.

The appellant requested that the patent be revoked.

The respondent requested that the appeal be dismissed (main request) or, in the alternative, that the patent be maintained on the basis of the first auxiliary request filed with letter dated 21 October 2005 or on the basis of the second or third auxiliary request filed during the oral proceedings.

V. Claim 1 of the main request and of the second and the third auxiliary request is identical to claim 1 as upheld by the opposition division.

The first auxiliary request comprising claims 1 and 2 differs in that in claim 1 the preferred range of $1.0 \leq X \leq 2.0$ was inserted additionally.

The second and third auxiliary request comprising identical claims 1 and 2 differ with respect to the amendments to the description. In the description of the second auxiliary request the examples 2, 8, 9 and 21 have been deleted, in the description of the third auxiliary request these examples have been marked as being outside of the scope of the claims.

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

The starting point for the evaluation of inventive step should be based on D1 which disclosed a flux cored welding electrode for gas-shielded arc welding with the object to provide excellent impact value at low

temperatures and thus addressed and solved the same problem as indicated in the patent in suit. Therefore, the remaining objective problem to be solved by the claimed subject-matter was to be seen in an improvement of arc stability. D1 already indicated that improvement of arc stabilisation could be achieved by adding metal fluorides in an amount of 0.01 to 0.3 % as F-content (column 2, lines 51 and column 5, lines 12 to 23) or an oxide or a carbonate of an alkali metal such as K, Na or Li (column 6, lines 4 to 7). Both D6 and D9 encouraged the skilled person to use Na and K in combination for this purpose.

The skilled person using the components and the ranges as suggested by D1 and adding Na and K as suggested in D6 or D9 would obtain a composition falling within the claimed range of $1.0 \leq X \leq 3.0$ as defined by the formula in claim 1. The formula lacked inventive merit, because it did not go beyond what was achieved when selecting a composition from the range disclosed by D1.

As regards the amount of Si to be selected the range of Si disclosed in D1 was overlapping the claimed range and values at the higher end portion of the range of D1 were obviously preferred by the skilled person. Therefore, the subject-matter of claim 1 lacked inventive activity.

The examples 2, 8, 9 and 21 were no longer covered by the claim. These examples were deleted in the second auxiliary request but showed excellent results concerning Charpy absorption energy, dropping, arc stability and sputter. Therefore, these examples represented information according to which it was

possible to obtain excellent results which solved the problem posed also outside of the X-value range presently claimed and it was necessary to leave these examples within the description in order to be able to distinguish between examples belonging to the invention disclosed and the more limited scope of protection defined by claim 1.

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

The main request and the first auxiliary request should be considered to comply with Rule 57a EPC and Article 84 EPC.

The starting point for the evaluation of inventive step should be formed by D1. D1 referred to a titania-based flux and differed from the claimed subject-matter in not referring to Na and K in specified ranges. Only one fluoride was present in the examples of table 1 and the plural used for metal fluorides in the table in column 2, lines 38 to 52 did not necessarily refer to the possibility to use two different metal fluorides in combination.

With respect to Na/K, the skilled person knew from D9 that Na and K could be used in a relation of 1/1. However, the reason given for using such dual stabilizing agent in D9 was directly related to the amount of metallic aluminium powder or added Al. Al was present in D9 in a range higher than that specified in the patent in suit and therefore, the skilled person would not be encouraged to follow the teaching of this document. The other documents specifying Na and K

referred to different ranges and did not specify the same relation.

Furthermore, D1 disclosed a different range for Si. D1 emphasized that the problem of coarse crystal grains in relation to increased Si content had to be taken into account. Therefore its teaching went in another direction and also none of the other cited documents referred to the claimed range of Si.

Particular importance should further be attached to the fact that neither D1 nor any other document cited disclosed a formula which enabled the skilled person to predict excellent properties for workability and toughness at low temperatures for a given selection of components from the claimed ranges.

The second auxiliary request should be considered allowable since the examples which no longer fell under the scope of the claim had been deleted in the description represented usual praxis in examination proceedings for bringing the description into line with the claimed subject-matter. Nothing more was required by the EPC.

Reasons for the Decision

1. The appeal is admissible.

2. *Formal admissibility of the requests*

In accordance with Rule 57a EPC, the claims, description and drawings may be amended provided that

the amendments are occasioned by grounds of opposition specified in Article 100 EPC.

Adding a new dependent claim 2 (main request) or introduction of a preferred feature in the independent claim (claim 1, auxiliary request 1) does not fall in this category and therefore these amendments are not admissible. Consequently the main request and first auxiliary request have to be rejected.

Claim 1 of the second auxiliary request is identical to claim 1 upheld by the opposition division. In claim 1 as originally filed the formula defined a range of values between 0.5 and 5.0. The more limited range of 1 to 3 now claimed is disclosed in the application as originally filed, page 16, lines 17 to 19. Claim 1 of the second auxiliary request does not give rise to objections under Article 123(2) EPC.

3. *Article 56 EPC*

3.1 D1 represents the closest prior art, which view was shared by the opposition division, the patent proprietor and the opponent. In accordance with the patent in suit D1 is concerned with a flux-cored wire electrode for gas shielded arc welding with excellent properties at low temperature, comprising a flux filled in the steel housing (column 3, lines 35 to 45), wherein the contents of TiO_2, Ti, Mg, Al, B, Mn, Si and metal fluorides are at least 4 to 8.5 % by weight TiO_2 (column 2, lines 44 to 52); 0.03 to 0.7 % by weight Ti (column 2, lines 44 to 52); 0.2 to 0.8 % by weight Mg (column 2, lines 44 to 52); < 0.5 % by weight Al (column 5, lines 42 to column 6, line 1 and table 1 in

D1), 0.002 to 0.025 % by weight B (column 2, lines 44 to 52); 1.0 to 3.0 % by weight Mn (column 2, lines 44 to 52); 0.1 to 1.2 % by weight Si, (column 2, lines 44 to 52); 0.01 to 0.3 % by weight metal fluorides (column 2, line 52, see also column 5, lines 13 to 23); respectively, based on the total weight of the wire electrode.

3.2 The subject-matter of claim 1 of the patent in suit differs from what is known from D1 essentially by

(i) a range defined by:

$1.0 \leq (Mg + 100 \times B + 0.1 \times Ti + 0.1 \times Mn + K + Na)/Si \leq 3.0$

(ii) the wire electrode containing 0.001 to 0.5 % of both, Na and K (whereas in D1 0.01 to 0.30 % in weight of metal fluorides are specified)

(iii) the wire electrode containing 0.5 to 3.0 % Si (whereas D1 specifies 0.1 to 1.2 % weight of Si).

The subject-matter of claim 1 is therefore novel.

3.3 The problem to be solved according to the patent in suit is related to good welding workability for all position welding, particularly for vertical position welding and overhead position welding and excellent low-temperature toughness (paragraph 0005). These objectives are achieved by the claimed flux-cored wire electrode as can be derived from figure 4 and table 2 which demonstrate that by the application of the requirements following from the formula and observing

the claimed ranges of the constituents it is rendered possible to predict an excellent workability at vertical and overhead positions at low temperature.

3.4 In none of the cited documents could the skilled person facing this problem find a pointer to such a solution, as already correctly argued by the opposition division starting from D1 and considering the disclosure of D4, D5, D6 or D9.

3.5 The appellant considered the problem to be limited to improving arc stabilisation and therefore was of the opinion that the skilled person was directly led to improve this feature by increasing the positive effect upon arc stabilisation by Na and K as mentioned in D1 and further emphasized in D4, D5, D6 and D9.

However, even if limiting the problem to arc stabilisation, the combination of D1 with the teaching derived from further cited documents does not lead to the subject-matter claimed.

It is true, that D1 already suggests with respect to arc stabilisation a range of 0.01 to 0.3 % of metal fluoride, and mentions ***inter alia*** Na and K (column 5, lines 13 to 23) and also oxides or carbonates of an alkali metal such as K, Na or Li, which may be contained in the filler flux (column 6, lines 4 to 7). In table 1 of D1, the wire numbers 1 to 4 refer to titania-base fluxes. In these four examples either CaF_2 or NaF is used as metal fluoride. Therefore, D1 neither limits the metal fluoride to NaF and KF nor indicates the claimed individual range for both, Na and K.

D4 refers with respect to arc stabilization to an oxide or a fluoride of Na and K, etc. The amount is indicated as lying within 0.3 top 4 % and hence greatly exceeds the claimed amount.

D5 refers to both, Na and K in combination, but within a different range (0.2 to 0.9 % (Na and K)). This range is not claimed in the patent in suit since as shown in its table 1 - in comparative examples 38 and 39 - more than 0.5 % of one kind leads to bad results with respect to dropping which is one of the important characteristics with respect to workability in vertical and overhead positions. Therefore, a general range of 0.2 to 0.9 % (Na and K) is not sufficient to solve the problem posed and to provide the necessary information.

D6 refers to either NaF and KF alone or both in combination but in a range of 0.03 to 0.3 %. Therefore, the necessity to add both to the composition has not been recognized and cannot be deduced therefrom and the teaching of D6 does not go beyond the teaching of D1 alone.

D9 refers to both, Na and K with the preferred relation of 1/1. However, the reason given therefor in D9 is related to the amount of Al. Al is present in D9 in a range of 0.5 to 2.0 % and thus above the range specified in the patent in suit and therefore, the skilled person would not be encouraged to follow the teaching of this document.

3.6 Therefore, even assuming that the skilled person, starting from D1 and considering D4 to D6 or D9 could have added both Na and K in order to increase the arc

stability at all positions of welding with a doping effect when these components are present in the electrode wire, there was no teaching to add an amount in the ranges claimed. He would find in D4 to D6 and D9 no indication to use both Na and K together in combination with the necessity to limit the range for Na and for K individually to 0.001 to 0.5 %. Already for this reason the subject-matter of claim 1 involves an inventive step.

3.7 However, the problem to be solved is not only related to the increase of arc stability. Good welding workability for all position welding, particularly for vertical position welding and overhead position welding and excellent low-temperature toughness is not only related to arc stabilisation but to the combination of components within their ranges as claimed which is convincingly presented by tables 1 and 2 in the patent in suit.

Neither D1 nor any other document suggest the formulation of such a dependency with the intention to predict reliably excellent values for workability and toughness at low temperatures by a formula. Therefore, the prior art lacks any basis for the contention that the relation expressed by the formula
(Mg + 100 x B + 0.1 x Ti + 0.1 x Mn + K + Na)/Si and the claimed range of 1 to 3 calculated in accordance with this formula should be obvious to the skilled person.

The same applies for the considerations regarding Si. Starting from D1 (disclosing 0.1 to 1.2 % Si) its teaching strongly points to the fact that Si has an

effect of coarsening the crystal grains and thereby lowering the notch toughness of the deposited metal when added in amounts of more than 1.2 % (column 5, lines 7 to 10). This teaching would hinder the skilled person to extend the range indicated in D1 to the one claimed since also none of the other cited documents refers to the claimed range.

3.8 Hence, in the absence of any teaching for the combination and ranges as claimed, choosing the ranges of the components and establishing a formula which resulted in pre-selecting the combination and ranges in a way to arrive reliably at a flux cored wire yielding best results for good welding workability for all position welding and excellent low-temperature toughness the subject-matter of claim 1 is based on an inventive step.

4. *Amendments to the description*

The appellant filed two versions of an amended description in order to bring the description into line with the subject-matter claimed. In the first version (auxiliary request 2) the examples no longer falling within the range of 1 to 3, calculated in accordance with the formula defined in claim 1 were deleted, whereas in the second version (auxiliary request 3) these examples were indicated as being outside the scope of the claims.

The board accepts that this is a case in which the description should be amended to bring it into line with the subject matter of the amended claims. As to auxiliary request 2, however, the Board considers that

with such an amendment there is a danger that some national courts might interpret the scope of the amended claims as extending beyond the literal limits of the claims and, in particular, as extending into the range of the examples which are sought to be deleted. The Board mentions this bearing in mind the risk of non-consistent application of Article 69 EPC in the contracting states. The danger of such an interpretation exists in the present case particularly having regard to the absence of any negative decision concerning inventive step of the subject matter of a claim containing the broader range of 0.5 to 5 in the granted patent and the fact that some of the examples no longer falling within the claimed range of claim 1 of the amended patent also show the same excellent results as the examples falling in the more limited range of 1 to 3. In the exercise of its discretion and in order to avoid legal uncertainty, the board therefore refuses this request.

As to auxiliary request 3, there is no such objection. The amendments to the description will operate as a disclaimer and thus bring legal certainty to the construction of the claims. The Board therefore accepts this request as an appropriate amendment.

5. *Specific questions raised by the appellant*

In the Statement of Grounds of appeal the appellant raised two questions to be answered by the Board and, if found necessary, to refer these questions to the Enlarged Board of Appeal.

The Board considers that in appeal proceedings it should focus on the issues to be decided and only in so far as questions posed by a party are directly relevant for deciding these issues consideration of such questions may be appropriate.

As follows from the above reasons for the decision the appellant's questions have not played any direct role in arriving at the decision and therefore lack the necessary relevance.

It is to be noted, however, that in fact the issues raised have been answered indirectly in the present decision. First, by concluding that the claimed subject-matter is inventive (question I) and second by deciding that the examples not any longer falling within the scope of the claimed subject-matter should not be deleted but should be indicated as being outside the scope of the claims (question II).

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent on the basis of the third auxiliary request:
claims 1 and 2 and the description, columns 1, 2, 2a, 3 to 8 both as filed during the oral proceedings on 24 November 2005 together with figures 1 to 4 as granted.

The Registrar: The Chairman:

M. Patin P. Alting van Geusau