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D E C I S I O N
of 21 March 2000

Case Number: T 0260/96 - 3.2.2

Application Number: 87107884.6

Publication Number: 0249117

IPC: C22C 38/38

Language of the proceedings: EN

Title of invention:
A process for preparing a crevice corrosion-resistant non-magnetic steel

Patentee:
Kabushiki Kaisha Toshiba

Opponent:
Vereinigte Schmiedewerke GmbH
Société FORTECH

Headword:
-

Relevant legal provisions:
EPC Art. 123(3), 56
EPC R. 67

Keyword:
"Extension of protection (no)"
"Inventive step (no)"
"Procedural violation (no)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0260/96 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 21 March 2000

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office posted 18 January 1996 revoking European patent No. 0 249 117 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: W. D. Weiß
Members: S. S. Chowdhury
R. T. Menapace

Summary of Facts and Submissions

I. The Appellant (Kabushiki Kaishi Toshiba, patent proprietor) lodged an appeal against the decision of the Opposition Division to revoke the patent No. 0 249 117 on 14 March 1996 and paid the appeal fee on the same day.

The statement setting out the grounds of appeal was received on 20 May 1996.

In the decision which had been dispatched on 18 January 1996 the Opposition Division held that amended claims submitted during the opposition procedure did not meet the requirement of Article 123(3) EPC. Additionally, the Opposition Division gave its opinion that the claimed subject-matter lacked an inventive step.

The following prior art documents among those regarded as relevant by the Opposition Division have been taken into account as relevant documents during the appeal proceedings:

(1) Techn. Mittg. Krupp, Werksberichte, 38, (1980), No. 2, pages 69 to 72

(2) AT-C-337 235

(9) Journ. Iron Steel Institute, March 1967, pages 292 to 304

(16) F. Fidler: Endwinding retaining rings for generator rotors, The Metallurgist and Materials Technologists, July 1979, pages 395 to 399

(17) Congrès International de la Grosse Forge, Paris 20 to 25 April 1975, vol. II, pages 681 to 696.

II. Oral proceedings before the Board took place on 21 March 2000.

At the end of the oral proceedings the Appellant requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of claims filed on 20 September 1994, and that the appeal fee be reimbursed.

The Respondents (Vereinigte Schmiedewerke GmbH, Respondent I, and Société FORTECH, Respondent II) requested that the appeal be dismissed.

III. The independent claim 1 reads as follows:

"A process for the manufacture of a crevice corrosion resistant, non-magnetic retaining ring for a generator comprising the steps of: preparing an ingot consisting of, in terms of weight percentage, 0.4% or less of carbon, above 0.3 but up to 1% of nitrogen, 2% or less of silicon, 12% to 20% of chromium, 13 to 25% manganese, 0 to 5% by weight of molybdenum, the balance consisting of iron and impurities, the total content of the chromium and manganese being at least 30%, including the step of supplying nitrogen by using a Cr-N mother alloy and/or a Cr-Fe-N mother alloy and/or by melting under a pressure of 0.3 to 1.0 MPa of nitrogen; subjecting the ingot to hot-forging at a temperature of 900-1200° C; solution treating the hot-forged steel at a temperature of 900 to 1200° C; and cold working the solution treated steel."

IV. The Respondents essentially argued as follows:

The Article 123(3) EPC issue was adequately discussed at the oral proceedings before the Opposition Division and the decision was procedurally and factually correct.

Someone who made a steel according to the process of claim 1 as granted would infringe the patent, but someone who made a retainer ring according to the process of amended claim 1 would not infringe the patent as granted. This indicated that the protection has been extended. Claim 6 only described the use of the steel and, by virtue of Article 64(2) EPC, originally covered a steel directly made by the process thereof. After amendment, however, it covered a retainer ring which was not originally protected. This also showed that the protection had been extended.

Regarding inventive step Respondent I submitted that document (1) described a steel for a retainer ring, having the composition as defined in claim 1 of the opposed patent, and additionally, the normal processing steps of forging, solution treatment, and cold working. The only features not disclosed were the actual temperatures, but these could be deduced from the colour prints of the process described in the document. Moreover, these temperatures were also given in Document (9), which additionally disclosed one of the alternative methods of introducing nitrogen into the steel. Therefore, starting from Document (1) and bearing the teaching of Document (9) in mind, the process of claim 1 was obvious.

Respondent II submitted, in respect of inventive step, that document (16) described the same retainer ring as the opposed patent and also had the objective of providing corrosion resistance, and disclosed the

process steps and temperatures to be used to shape and treat the steel. The manner of introducing nitrogen was generally known in the art, and a combination of the teaching of Document (1) with that of any of the Documents (9), (16) or (17) would lead to the process of claim 1 as an obvious combination.

V. The Appellant essentially argued as follows:

Article 123(3) EPC: The Opposition Division did not act in good faith and surprised the Appellant at the oral proceedings with a new ground of its own motion. By not raising this objections in the interim communication dated 16 June 1995 the Opposition Division misled the patentee into believing there was no objection under Article 123(3) EPC. This communication was not provisional as regards the legal questions otherwise the spirit of Rule 71a EPC was not met. Moreover, the Appellant's right to be heard was violated. The Opposition Division committed a severe procedural violation in deciding to revoke the patent on this ground, since it raised this objection for the first time at the oral proceedings.

The amendment to claim 1 had the effect of narrowing the extent of protection since a method of manufacturing a steel was claimed in claim 1 as granted, and the amended claim 1 claimed a retainer ring made from the same steel, and therefore did satisfy the requirement of Article 123(3) EPC.

As regards inventive step the process steps described in Document (1) referred only to the UKR-N steel which was not in conformance with the composition according to claim 1, and not to the P 900 steel. Moreover, colour prints may not be used to derive temperatures. Documents (16) and (17) disclosed the process steps of claim 1 but not the steel with a composition according

to claim 1, and, moreover, the latter disclosed a forging step (bigornage) carried out at a temperature down to 850°C, in contrast to the opposed invention, in which it was important not to go below 900°C. To combine the teaching of these documents was using hindsight, since the person skilled in the art would not have done so with the expectation of any useful result.

Document (9) dealt mainly with household utensils and the person skilled in the art had no reason to consult this document if he had a problem with a retainer ring for a generator.

VI. At the appeal stage Respondent II raised for the first time the ground of opposition under Article 100(b) EPC. At the oral proceedings before the Board the Appellant refused his consent to the introduction of this new ground into the procedure.

Reasons for the Decision

1. The appeal is admissible.

2. *Article 123(3) EPC*

The Appellant stated at the oral proceedings before the Board that the use of the word "comprising" in claim 1 means that the step of shaping a steel ingot into a retainer ring is an additional and separate step inserted between the steps of hot forging and solution treatment. The Board accepts this explanation since it is supported by the statement in the sentence linking pages 5 and 6 of the opposed patent specification, that

"a cast ingot is subjected to a hot forging treatment at a temperature of 900 to 1200° C and then [emphasis added] formed into a ring shape, followed by a solution treatment at a temperature of 900 to 1200° C".

Given the above, the amended claim is to be seen as including the steps of hot forging and solution treatment at temperatures of 900 to 1200° C, as in the granted claim, and then the step of forming the ingot into a ring shape, as an additional step. Moreover, the interjection of this extra step between the steps of hot forging and solution treatment causes no alteration or substitution of any other step of the claim, or the alteration of the sequence of the steps, such that the extent of protection afforded by the claim may be considered to be extended.

Moreover, the end product of the claim as granted is a steel ingot, which must have some form, not specified in the claim. The end product of the amended claim is a steel object having a specific shape, namely a ring shape, whereby the steel is the same as that of the granted claim. Therefore, the extent of protection has been limited rather than extended.

Therefore, there is no objection to the amended claims under Article 123(3) EPC.

3. *Novelty*

This has not been an issue during the appeal procedure and the Board sees no reason for investigating this point, suffice it to say that none of the documents cited by the Respondents discloses a process for

treating a steel having the composition defined in claim 1, and using the process steps defined in the claim, so as to form a retaining ring for a generator. The Board is also not aware of any other such state of the art.

4. *Inventive step*

4.1 Object of the patent in suit

The subject-matter of claim 1 of the opposed patent relates to a process for the manufacture of a crevice corrosion resistant, non-magnetic retaining ring for a generator, which steel is a CrMnN-Fe alloy high in manganese and nickel-free, and excellent in corrosion resistance.

The object of the patent in suit is stated (at page 4, lines 35 to 37 of the patent specification) as "to provide a process for preparing a high manganese non-magnetic steel excellent in general corrosion resistance, pitting corrosion resistance, crevice corrosion resistance and SCC resistance."

That the claimed subject-matter is successful in achieving the stated object is credible in view of the comparative results provided in the patent specification.

4.2 Closest prior art

Document (1) discloses such a process for the manufacture of a crevice corrosion resistant, non-magnetic retaining ring for a generator. This document

was regarded by the Respondents and the Appellant as being the closest prior art document and the Board agrees that this is a suitable prior art, starting from which the inventive merit of the claimed process may be assessed.

4.2.1 This document describes the composition of steels used by the firm Krupp from 1901 until 1980 for the manufacture of retaining rings for generators. In particular, it describes, in Tafel 1 on page 70, a steel designated as P 900, which has a composition falling under the terms of claim 1 of the opposed patent, and a steel designated as UKR-N, which has a composition not falling under the terms the claim. The section "3 Fertigungsablauf..." on page 70 goes on to describe some process steps performed on the steel, including forging, solution treatment, and cold forming.

4.2.3 There is disagreement amongst the parties, as to whether or not these steps are applied only to the UKR-N steel or also to the P 900 steel. The Board is convinced, however, that the sequence of steps forging, solution annealing, and cold forming is typically applied to a steel heat for rendering it suitable for use as a retainer ring for a generator. This is supported by the cited documents (see, for example, Document (2), page 5, lines 6 to 11, Document (9), page 294, under "Experimental" and "Mechanical properties", Document (16), Figure 3, and Document (17), Planche 7 on page 693), each of which describes a process for the manufacture of a non-magnetic retaining ring for a generator and includes these steps, which were termed "normal" steps by the Respondents.

The skilled person is well aware not only of the fact that these steps are necessary, but also of their intended effect. In particular, the forging temperature should be controlled between upper and lower limits so as to provide a fine and homogeneous grain size, and to avoid recrystallisation of large grains in the subsequent solution treatment step for maintaining carbides in solution. This is followed by the step of cold working to provide the necessary yield strength. These properties are essential in order to give the retainer rings the required mechanical properties for withstanding the high forces they are subjected to in use.

In view of the above and in the absence of any evidence to the contrary it must be concluded that the steel P 900 of Document (1) was also subjected to the usual sequence of steps hot forging, solution treatment, and cold rolling. This document fails, however, to disclose the details of the temperatures used for hot forging and solution treatment, and the manner in which nitrogen was added to the steel melt.

4.3 Problem to be solved

This is seen in the selection of the optimum temperature ranges of hot forging and solution treatment, and the manner of introduction of nitrogen to the melt, so as to attain the above objects of the invention.

4.4 Inventive step

The P 900 steel used according to Document (1) for the production of retainer rings did not result from a completely new development. Rather, the class of steel compositions to which it belongs had originally been developed during the 1960s as a less expensive nickel

free substitute for austinitic stainless NiCr-steels, which were falling into disfavour, see Document (9). According to this document, the steels of this grade are suitable inter alia for engineering in general as well as for assembled components of composite equipment (see the first paragraph on page 292). In particular, this document discloses a steel (B5 in Table II on page 294) which has the same composition as the steel defined in claim 1, and in the section "Experimental" below this table are given details of the temperatures used for hot forging and solution treatment, respectively as 1150°C and 1050°C, which fall within the ranges defined in claim 1. The steel was subsequently cold rolled (page 294, under "Mechanical properties"). This document also discloses how nitrogen may be introduced into the steel, using a method (page 293 the last part of the penultimate paragraph) defined as an alternative in claim 1. Thus, from this document, the person skilled in the art learns the temperatures at which hot forging and solution treatment are to be performed, and the manner in which nitrogen is introduced, for steels of the composition of the steel P 900.

The person skilled in the art was also aware of the reasons why he had to apply utmost care in the selection of the temperature ranges for performing the hot forging and solution annealing treatment steps. An excessively low hot forging temperature would induce excessive grain growth during the subsequent solution annealing step. A high yield strength which is indispensable, however, during the use of retainer rings requires a fine grain structure. The temperature range for the solution annealing step is governed by

the requirement to dissolve all carbide precipitations and to suppress their re-formation, since carbide precipitation at the grain boundaries is the source of various kinds of corrosion, see for example Document (16), page 396, left column.

The steps used in the process of claim 1 are used for the same purpose as in the prior art, bearing in mind the above mechanism of corrosion formation. This was acknowledged by the Respondent in his submission during the opposition procedure, dated 20 September 1994, see Annex 1.

Thus, the person skilled in the art would know that certain lower temperatures must be respected during the hot forging and solution treatment steps, as stated in Document (16). This document illustrates the case of a steel not having the composition of the steel of claim 1 of the patent in suit, and the forging and solution treatment temperature ranges are somewhat different, accordingly, namely 1150 to 900°C and 1050°C, respectively.

As was clearly established at the oral proceedings before the Board, each steel composition must be treated at its own particular temperature ranges. However, given that the person skilled in the art has a particular effect to achieve (corrosion resistance) and knows the mechanism causing the effect to fail (deposition of carbides at grain boundaries) as well as the steps to be taken to avoid this failure (control the lower forging and solution treatment temperatures), he would be able by routine methods to find the lower treatment temperatures for the P 900 steel of Document (1).

Therefore, starting from the steel P 900 of Document (1) in order to work the steel into a retainer ring for a generator that is corrosion resistant, the person skilled in the art would use the steps of hot-forging, solution treating the hot-forged steel, and cold working the solution treated steel, and select the appropriate temperatures by applying the teaching of Document (9) and by routine application of his knowledge and without exercising any inventive skills.

As regards the manner in which nitrogen is added to the steel, the alternative methods defined in claim 1, all appear to be well known in the art. In particular, the use of ferro-chrome alloys is well known in this respect, as exemplified by Document (9), see page 301, right column and page 302, left column. In fact, there would not appear to be other methods of introducing nitrogen, so one of the alternatives in claim 1 must be used. The claimed method of adding nitrogen to the steel is not inventive, accordingly.

Therefore, the process of claim 1 lacks an inventive step.

5. *Other procedural matters*

5.1 Since the Appellant has refused his permission for the introduction of the new ground of opposition under Article 100(b) EPC, this ground may not be considered in the present case, in accordance with the Enlarged Board of Appeal's decision G 0001/95, OJ 1996, 615.

5.2 Since, pursuant to Rule 67 EPC, reimbursement of the appeal fee is conditional upon the appeal being found allowable, the request of the Appellant in this respect cannot be granted.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

E. Commare W. D. Weiß