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D E C I S I O N
of 22 February 2005

Case Number: T 0718/02 - 3.2.2

Application Number: 96300381.9

Publication Number: 0735151

IPC: C22C 16/00

Language of the proceedings: EN

Title of invention:

Alloy for improved corrosion resistance of nuclear reactor components

Patentee:

GENERAL ELECTRIC COMPANY

Opponent:

Framatome ANP GmbH

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56

Keyword:

"Novelty and inventive step - yes - (after amendment)"

Decisions cited:

T 0624/91

Catchword:

-



Case Number: T 0718/02 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 22 February 2005

Appellant: GENERAL ELECTRIC COMPANY
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Representative: Tomlinson, Edward James
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Respondent: Framatome ANP GmbH
(Opponent) Freyeslebenstrasse 1
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 16 May 2002
revoking European patent No. 0735151 pursuant
to Article 102(1) EPC.

Composition of the Board:

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

Summary of Facts and Submissions

- I. The appellant (patentee) lodged an appeal on 8 July 2002 against the decision of the opposition division, posted on 16 May 2002, revoking European patent No. 0 735 151. The fee for appeal was paid simultaneously and the statement setting out the grounds of appeal was received on 16 September 2002.
- II. The opposition division held that the subject matter of the claims according to the main request and five auxiliary requests was either not new or did not involve an inventive step with respect to the prior art:

D1: US-A-4 992 240 and

D2: H. G. Weidinger, F. Garzarolli, C. M. Eucken, E. F. Borocho: "Effect of Chemistry on Elevated Temperature Nodular Corrosion", in: Zirconium in the Nuclear Industry, Seventh International Symposium sponsored by ASTM Committee B-10 on Reactive and Refractory Metals, Strasbourg, France, 24-27 June 1985, ASTM Special Technical Publication 939, ASTM Publication Code No. 04-93900-35, pages 364 to 386

- III. In order to meet the requests of both parties, oral proceedings were held on 22 February 2005.

With its letter of 18 February 2005, the respondent (opponent) informed the Board that it would not attend the oral proceedings having regard to the limited claims enclosed with the appellant's letter of 21 January 2005.

At the oral proceedings, the appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the single claim and the description, pages 2 to 4, adapted thereto, as filed on 22 February 2005.

In the written proceedings, the respondent requested that the appeal be dismissed.

IV. Claim 1 of the main request reads as follows:

"1. A zirconium-based alloy having a composition consisting of, by weight, 1.0% tin, 1.2% chromium and 0.1% iron, optionally 500-2000 ppm O₂ and the remainder zirconium and inevitable impurities."

V. In support of his request, the appellant relied essentially on the following submissions:

Table 6 of document D2 disclosed nineteen individual alloy compositions with no apparent systematic variations in compositions other than the tin content which was used to divide the various alloys into six separate groups with the parameter $X (\%) = (Fe + Cr - 1.3Ni)/2 + 4.6Ni$ being plotted in Figure 5. The tin contents of the six groups were $\leq 0.6\%$, 1.2%, 1.6%, 1.7%, 2.1% and 5.1% Sn. As could be seen, none of the exemplifying alloy compositions given in Table 1 came close to the claimed tin content of 1.0%, the less so since the claimed tin content had to be combined with the claimed contents of Fe and Cr. As the authors of document D2 essentially aimed at evaluating the effect of the Zr-alloy chemistry on elevated temperature

nodular corrosion, a skilled person, in his search for a Zr-alloy exhibiting an excellent match in a superior resistance to corrosion and hydriding and improved mechanical properties after irradiation, was not prompted to select the claimed zirconium alloy. Hence the zirconium alloy claimed in the patent was novel and involved an inventive step vis-à-vis the teaching given in document D2.

VI. In the written proceedings, the respondent argued as follows:

As to the novelty of point-like alloy compositions, one featuring in the present claim, the three criteria for the novelty of a selection were to be applied vis-à-vis the disclosure of document D2. This document disclosed Zr-Sn-Cr-Fe alloys having a high resistance to nodular corrosion which made them appropriate for producing structural parts for use in boiling water reactor (BWR) environments. The composition of alloy Nos. 2, 3, 4, 10 and 15 given in Table 6 of D2 were close to the exemplifying compositions set out in the patent. Although the claimed point-like alloy composition could be regarded as being "narrow" in relation to the elemental ranges given in D2, it nevertheless failed to satisfy at least the second criterion for the novelty of a selection. Dismissal of the appeal was therefore requested.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

The single claim results from a combination of claims 3 and 1 as granted and refers to the alloy VA in the originally filed description. The description has been suitably adapted to the revised claim. Hence, there are no formal objections to the amended documents with regard to Article 123 EPC.

3. *The patent*

The patent at issue relates to a zirconium alloy having a combination of improved resistance to corrosion and hydriding and an improved irradiation strength and ductility which renders it suitable for use in BWR components. As shown in Tables 1 to 3 of the patent, this combination of properties is achieved by the individual alloy composition set out in the single claim.

4. *Novelty*

4.1 The document D2 as the closest prior art discloses a zirconium alloy Type III comprising 0.02 to 5.14% Sn, 0.04 to 0.57% Fe, 0.04 to 2.76% Cr, 0.003 to 0.046% Ni, the remainder being Zr and residuals (cf. D2, page 365, Table 1a). The point-like composition of the zirconium alloy set out in the single claim of the patent at issue falls within the elemental ranges defining alloy type III. It therefore has to be examined whether the

claimed alloy composition satisfies the three criteria for the novelty of a selection of a sub-range from the broader range of the zirconium alloys known from document D2.

The appellant has argued in this context that the individual composition of the zirconium alloy featuring in the claim constitutes a particular chemical compound and therefore should not be regarded as a (sub-)range.

However, according to decision T 624/91, a nominal (point-like) disclosure of an alloy composition does not disclose the composition exclusively as a specific point which nobody would be able to realise in practice, but must be interpreted as average values within a small range in view of known fluctuations in reproducibility and in analytical results, unless there is evidence available to the contrary.

Applying this principle to the present case, the singular composition claimed in the patent has to be interpreted as a very narrow "sub"-range which has been selected from the broad range of the alloy compositions known from D2. This means that the first criterion for the novelty of a selection is met.

As to the second criterion, document D2 discloses nineteen exemplifying compositions of alloy type III (cf. D2, Table 6). The alloys with the tin content closest to that claimed (1.0% Sn) are No. 10 (1.22% Sn) and No. 15 (1.18% Sn), both comprising 0.34% Fe which is more than three times the iron content of the claimed alloy. The chromium contents are 0.56% (No. 10) and 2.76% (No. 15) which is about half and more than

double that stated in the claim, respectively. It is therefore concluded that the composition selected in the claim is sufficiently removed from the preferred part of Zr alloys type III known from document D2.

The third criterion requires the selected range to be a "purposive" rather than an arbitrary selection from the prior art. As set out above, document D2 discusses no property other than the nodular corrosion resistance depending on the alloy chemistry. The impact of the alloying elements Sn, Cr, Fe and Ni on nodular corrosion is depicted in Figure 5 of D2. In contrast, the claimed zirconium alloy exhibits a well-balanced combination of properties, namely improved resistance to corrosion and hydriding and improved post-irradiation strength and ductility, as compared to Zircaloy-2 and other zirconium alloys conventionally used. There is no technical information found anywhere in document D2 implying that this excellent match in the anti-corrosion and structural properties, in particular after irradiation in a BWR environment, could be achieved by designing the claimed zirconium alloy composition. The outstanding combination of properties and the technical improvement associated therewith permits the inference that the claimed Zr alloy is not an arbitrarily chosen specimen from the zirconium alloys type III given in document D2, so that the third criterion is likewise met.

- 4.2 The claimed zirconium alloy differs from the one given in document D1 in that in the alloy composition known from this document chromium is restricted to 0.1 to 0.6% and iron to 0.2 to 0.4%.

The claimed subject matter is therefore novel.

5. *Inventive step*

Starting from document D2 as the closest prior art, the objective problem to be solved by the present patent resides in providing a zirconium alloy suitable for use in BWR environments and exhibiting the outstanding combination of properties mentioned above. As has been previously shown, there is no indication in the prior art D1 and D2 pointing towards the selection of the claimed composition of a zirconium alloy and, therefore, it could not have been expected that the claimed Zr alloy would actually exhibit the combination of properties sought.

The claimed subject matter therefore also involves an inventive step.

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 with the order to maintain the patent on the basis of the following documents:

single claim and description, pages 2 to 4, as filed at the oral proceedings on 22 February 2005.

The Registrar:

The Chairman:

V. Commare

T. K. H. Kriner