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D E C I S I O N
of 28 November 1995

Case Number: T 0484/93 - 3.4.1

Application Number: 84115485.9

Publication Number: 0148452

IPC: G21C 3/32

Language of the proceedings: EN

Title of invention:
A coolant flow mixing grid for a nuclear reactor fuel assembly

Patentee:
WESTINGHOUSE ELECTRIC CORPORATION

Opponents:
Siemens AG
FRAMATOME, S.A.

Headword:
Mixing grid for a fuel assembly/WESTINGHOUSE ELECTRIC CORPORATION

Relevant legal provisions:
EPC Art. 54(3)

Keyword:
"Novelty - denied"

Decisions cited:
-

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0484/93 - 3.4.1

D E C I S I O N
of the Technical Board of Appeal 3.4.1
of 28 November 1995

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office dated 17 March 1993 rejecting the opposition filed against European patent No. 0 148 452 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: G. D. Paterson
Members: R. K. Shukla
U. G. O. Himmler

Summary of Facts and Submissions

I. European patent No. 0 148 452 claims the priority date of 30 December 1983 from US patent application Nos. 567450 and 567448 and relates to a coolant flow mixing grid for a nuclear reactor fuel assembly. This patent was opposed by Siemens AG (Opponent 1) and FRAMATOME SA (Opponent 2) on the grounds that the subject-matter of the patent was not new in relation to each of following prior art documents:

D1: DE-A-2 157 742 and
D5: EP-A-0 146 896,

and that the subject-matter of the patent did not involve an inventive step having regard to document D1 and, inter alia, document D6: DE-A-1 439 362.

Document D5 was cited pursuant to Article 54(3) EPC.

The Opposition Division rejected the oppositions pursuant to Article 102(2) EPC.

II. The only independent claim of the patent forming the basis of the decision of the Opposition Division reads as follows:

"1. A coolant-flow mixing grid for promoting the mixing of coolant flow through a nuclear-reactor fuel assembly along and between fuel rods supported by transverse support grids mounted on control-guide thimbles of the fuel assembly, said coolant-flow mixing grid (34) comprising a plurality of interleaved inner straps (44) arranged in an egg-crate-like configuration to define a plurality of inner cell openings (46) for receiving respective ones of the fuel rods, at least one mixing

vane (52) for each of at least a number of said inner cell openings (46), said mixing vane being disposed on one of the inner straps and projecting therefrom in the downstream direction of said coolant flow and inwards generally toward the longitudinal axis of the cell opening in a manner such as to deflect coolant laterally, and a rigid protrusion (54) disposed on said inner strap and which projects therefrom into the associated inner cell opening, characterized in that said mixing vane (52) is disposed on one of the four strap segments defining the respective inner cell opening (46) and projects therefrom so as to deflect coolant from one fuel rod toward an adjacent fuel rod, and that said rigid protrusion (54) is a fuel-rod non-supporting protrusion disposed upstream of said mixing vane (52) on the inner lateral face of said strap segment and projecting into the associated inner cell openings (46) to an extent sufficient only to protect the associated mixing vane (52) from damaging impact when a fuel rod disposed in the cell opening undergoes lateral motion."

III. According to the decision under appeal, the subject-matter of claim 1 is novel having regard to the cited prior art essentially for the following reasons:

Document D5, which is comprised in the state of the art according to Article 54(3) EPC, describes mixing grids which are only partial grids or combinations of partial grids; a partial mixing grid being a mixing grid which does not encompass the whole fuel rod assembly. Although the patent in dispute does not explicitly state whether the mixing grid is full or partial, a skilled person knows that the term "mixing grid" always refers to a "full mixing grid" if nothing else is explicitly stated. Therefore, the subject matter claimed in the patent in suit must be interpreted to relate to a full mixing

grid. Furthermore, a combination of partial grids does not constitute a full mixing grid even if the combination covers the entire fuel-rod assembly. Therefore, the claimed subject matter is new in relation to the disclosure in document D5.

In the fuel-rod assembly disclosed in document D1, the grid cells are provided with protrusions (6). However, it is not derivable from the document that the protrusions protrude sufficiently into the grid cells so as to protect the vanes against the damaging contact with the fuel rods. Document D1 thus does not prejudice the novelty of the subject-matter of claim 1.

The Examining Division in its decision also regarded the claimed invention as involving an inventive step having regard to the cited prior art.

IV. Both the Opponents filed appeals against the above decision, and requested that the decision of the Opposition Division be set aside and that the patent be revoked in its entirety, since its subject-matter is not new in relation to each of the Documents D1 and D5, and does not involve an inventive step having regard to the documents D1 and D6.

Opponent 1 also requested that two questions be referred to the Enlarged Board of Appeal, one relating to the finding of novelty of the subject-matter of a claim on the basis of an obscure feature which allegedly distinguishes the claimed subject-matter from the state of the art, and the second relating to a published drawing and its description, wherein dimensions of a constructional element are shown but its function is not stated.

V. Oral proceedings were held on 28 November 1995. The patent Proprietor submitted two main claims 1 forming the basis, respectively, of its first and second auxiliary requests. These claims are identical to claims 1 of the first and second auxiliary requests, respectively, filed during the opposition proceedings.

The Respondent requested that the appeals be dismissed.

VI. Claim 1 of the first auxiliary request differs from claim 1 of the granted patent (see section II above) in that the wording

"being a full grid extending across the full fuel assembly and"

has been inserted directly after the wording "said coolant-flow mixing grid (34)", and in that the wording

"said grid including the mixing vanes does not laterally support the fuel rods and that"

has been inserted after the wording "characterized in that".

Claim 1 according to the second auxiliary request reads as follows:

"1. A nuclear reactor fuel assembly including an array of elongate fuel rods, elongate control-rod guide thimbles extending longitudinally through the array of fuel rods, and fuel-rods supporting grids which extend across the fuel assembly and are spaced apart in the longitudinal directions thereof, characterized in that the fuel assembly (20) includes at least one additional transverse grid (34) which is supported between two of the fuel-rod supporting grids (26) and does not

laterally support the fuel rods, said additional grid being a coolant-flow mixing grid extending across the whole fuel assembly and comprising a plurality of interleaved inner straps (44) arranged in an egg-crate-like configuration to define a plurality of inner cell openings (46) for receiving respective ones of the fuel rods, at least one mixing vane (52) for each of at least a number of said inner cell openings (46), said mixing vane being disposed on one of the four strap segments defining the respective inner cell opening (46) and projecting therefrom in the downstream direction of said coolant flow and inwards generally toward the longitudinal axis of the cell opening in a manner such as to deflect coolant from one fuel rod toward an adjacent fuel rod, and a rigid protrusion (54) disposed on said inner strap, which protrusion is a fuel-rod non-supporting protrusion disposed upstream of said mixing vane (52) on the inner lateral face of said strap segment and projecting into the associated inner cell opening (46) to an extent sufficient only to protect the associated mixing vane (52) from damaging impact when a fuel rod disposed in the cell opening undergoes lateral motion."

VII. The arguments submitted by both the Opponents supporting lack of novelty of the claimed invention having regard to document D5 can be summarised as follows :

Document D5 describes a "partial" mixing grid (that is, a mixing grid that encompasses only a portion of the fuel rod assembly) with reference to Figure 2, but nevertheless has all the features of the mixing grid as defined by the wording of claim 1 of the patent in suit. Moreover, the mixing grids in the embodiments Figures 8 and 9, encompass the entire fuel rod assembly and are made of partial grids, which according to the description on page 17, lines 21 to 23, are the same as

the partial grid shown in Figure 2. A full mixing grid extending across the entire fuel-rod assembly is thus disclosed in document D5. It also follows from the description on page 11, lines 8 to 14 of document D5 that in the mixing grid according to the embodiment of Figure 2, the protrusions protecting the vanes do not support the fuel rods, so that the mixing grid in document D5 is solely a mixing grid as in the patent in suit.

Arguments were also raised by the Opponents against the subject-matter having regard to Article 56 and 123(3) EPC.

VIII. The patent Proprietor argued essentially as follows in support of the novelty of the claimed invention:

The purpose of Article 54(3) EPC is to prevent several patents being granted for the same subject-matter. In the present case document D5 is an earlier European patent application filed by the Proprietor of the patent in suit. Document D5 is concerned only with partial grids, whereas the subject-matter of the present invention is full mixing grids. It is clear from the patent in suit that it only relates to a full mixing grid which encompasses all the fuel rods in the fuel assembly. The claimed mixing grid must therefore be interpreted as a full mixing grid, which is not the same as **a combination of partial grids** encompassing all the fuel rods, such as shown in Figures 8 and 9 of document D5. The claimed subject matter is therefore new with respect to document D5.

IX. In a communication accompanying the summons to oral proceedings, the Board informed the parties inter alia of its provisional view that document D5 describes a full mixing grid falling within the meaning of claim 1, which could therefore be considered as lacking novelty.

X. At the conclusion of the oral proceedings the decision was announced that the decision of the Opposition Division is set aside and that the patent is revoked.

Reasons for the Decision

1. The only issue that needs to be considered in this appeal is that of novelty.

1.1 In the following discussion, the subject-matter of claim 1 of the second auxiliary request is considered. This is because the subject-matter of this claim includes, in addition to features relating to a nuclear reactor assembly, a mixing grid as defined in claim 1 of the main request and additionally the features of claim 1 of the first auxiliary request specifying that the mixing grid extends across the whole fuel assembly and does not support the fuel rods. The finding of lack of novelty in the subject-matter of claim 1 of the second auxiliary request for the reasons given below is therefore applicable to claims 1 of the main and first auxiliary requests.

1.2 Document D5 is a European patent application designating the same Contracting States as the patent in suit, and has a priority date of 21 December 1983 which is earlier than the priority date of 30 December 1983 of the patent

in suit. The right to the priority claimed in document D5 has not been disputed by the patent Proprietor. Document D5 therefore is comprised in the state of the art pursuant to Article 54(3) EPC.

1.3 Document D5 discloses (see Figure 1 and the corresponding description on page 7, line 20 to page 8, line 10) a nuclear reactor fuel assembly 10 including an array of elongate fuel rods 18, elongate control-rod guide thimbles 14 extending longitudinally through the array of fuel rods 18, and fuel-rods support grids 16 which extend across the fuel assembly and are spaced apart in the longitudinal directions thereof. The fuel assembly 10 includes at least one additional transverse grid 24 which is supported between two of the fuel-rod supporting grids 16 and is a partial grid in the sense that it does not extend across the entire fuel assembly as the support grids 16.

From the description on page 3, line 34 to page 4, line 2 it is clear that the partial grids of document D5 can be constructed either for deflecting the flowing coolant or for laterally supporting the fuel rods or for both purposes. The partial grid 24 shown in Figure 1 is described in detail with reference to Figures 2 to 6 and has the main function of deflecting or mixing the flowing coolant. According to page 9, last paragraph such a partial mixing grid can also support the fuel rods. Such a partial mixing grid with the supporting function is described in connection with Figure 7 (see page 15, last paragraph). However, the partial mixing grid 24 disclosed in connection with Figure 2 does not disclose any supporting function. On the contrary, it is

clear from page 11, lines 8 to 14 that protrusions 44 only have the purpose of protecting the vanes 42. Therefore, the grid disclosed in Figure 2 is a mixing grid with the sole purpose of deflecting the flowing coolant.

Figure 2 and the corresponding description thus discloses that the additional grid 24 is a coolant-flow mixing grid which does not laterally support the fuel rods.

Furthermore, it can be seen in Figure 2 that this mixing grid comprises a plurality of interleaved inner straps 34 arranged in an egg-crate-like configuration to define a plurality of inner cell openings 36 for receiving respective ones of the fuel rods 18 (see page 10, lines 6 to 10), and at least one mixing vane 42 for each of at least a number of said inner cell openings 36, said mixing vane being disposed on one of the four strap segments defining the respective inner cell opening 36 and projecting therefrom in the downstream direction of said coolant flow and inwards generally toward the longitudinal axis of the cell opening in a manner such as to deflect coolant from one fuel rod toward an adjacent fuel rod (see page 10, line 27 to page 11, line 7), and a rigid protrusion 44 disposed on said inner strap, which protrusion is a fuel-rod non-supporting protrusion disposed upstream of said mixing vane 42 on the inner lateral face of said strap segment and projecting into the associated inner cell opening 36 to an extent sufficient only to protect the associated mixing vane 42 from damaging impact when a fuel rod disposed in the cell opening undergoes lateral motion (see page 11, lines 8 to 18).

Document D5 further describes a fuel assembly which is partitioned into separate fuel rod groups each having a partial mixing grid associated therewith (see page 16, line 15 to page 17, line 28 and Figures 8 and 9). As shown in Figures 8 and 9, the partial mixing grids 90A, 90B, 90C and 90D are used with respective fuel rod groups of a given fuel assembly and are banded together, so that the assembly of partial mixing grids extends across the entire fuel assembly (see also page 4, lines 18 to 23). Furthermore, it is clearly stated on page 17, lines 21 to 24 that such a full grid can have the same construction as the mixing grid 24 shown in Figure 2; i.e. a mixing grid having features as explained above. The Board therefore does not accept the patent Proprietor's contention that the assembly of partial mixing grids as shown in Figures 8 and 9 of document D5 is not a full mixing grid within the meaning of claim 1 under consideration.

For the foregoing reasons, in the Board's judgment the subject-matter of claim 1 of the second auxiliary request lacks novelty.

It also therefore follows that claims 1 according to the main and the first auxiliary requests also lack novelty.

For the foregoing reasons, none of the requests submitted by the patent Proprietor fulfil the requirement of novelty according to Article 52(1) EPC.

2. Having regard to the above findings, the questions submitted by Opponent O1 for referral to the Enlarged Board are no longer appropriate for referral.

Order

For these reasons it is decided that:

1. The decision of the Opposition Division is set aside.

2. The appeals are allowed, and the European patent is revoked.

The Registrar: The Chairman:

M. Beer G. D. Paterson