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TerraPower, LLC 330 120th Ave. NE, Suite 100 Bellevue, WA 98005			O'CONNOR, MARSHALL P	
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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* CHARLES E. AHLFELD,  
JOHN ROGERS GILLELAND, RODERICK A. HYDE,  
MURIEL Y. ISHIKAWA, DAVID G. McALEES,  
NATHAN P. MYHRVOLD, CLARENCE T. TEGREENE,  
THOMAS ALLAN WEAVER, CHARLES WHITMER, and  
LOWELL L. WOOD JR

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Appeal 2015-001098  
Application 12/082,077  
Technology Center 3600

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Before CHARLES N. GREENHUT, MICHAEL L. HOELTER, and  
ANNETTE R. REIMERS, *Administrative Patent Judges*.

HOELTER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

This is a decision on appeal, under 35 U.S.C. § 134(a), from a final rejection of claims 213–215, 220, 222, 226, 228, 237, 239, 240, 243, 272, and 273. App. Br. 45–48, 50, 51, Claims App. Claims 1–212, 221, 223–225, 229–236, 249, and 256–266 have been canceled. App. Br. 45–47, 49, 50, Claims App. Claims 216–219, 227, 238, 241, 242, 244–248, 250–255,

and 267–271 have been withdrawn. App. Br. 45–50, Claims App. We have jurisdiction under 35 U.S.C. § 6(b). We REVERSE.

#### THE CLAIMED SUBJECT MATTER

The disclosed subject matter “relates to nuclear reactor fuel assemblies and more particularly relates to a nuclear fission reactor fuel assembly adapted to permit expansion of the nuclear fuel contained therein.” Spec. 1.<sup>1</sup> Independent claim 213 is illustrative of the claims on appeal and is reproduced below:

213. A method of operating a nuclear fission reactor fuel assembly, comprising the step of disposing an enclosure in a nuclear reactor vessel, said enclosure sealingly enclosing a nuclear fuel foam defining a plurality of interconnected open-cell voids within the nuclear fuel foam.

#### REFERENCES RELIED ON BY THE EXAMINER

Justheim <sup>2</sup>	US 3,028,330	Apr. 3, 1962
Benson	US 3,322,644	May 30, 1967

#### THE REJECTIONS ON APPEAL

Claims 213, 214, 220, 222, 226, 228, 237, 239, 240, 243, and 272 are rejected under 35 U.S.C. § 102(b) as anticipated by Benson.

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<sup>1</sup> Appellants’ Specification does not provide line or paragraph numbering, and accordingly, reference will only be made to the page number.

<sup>2</sup> The Justheim reference is repeatedly referred to as the Huntington reference in the Final Action, Appeal Brief and Examiner’s Answer. Huntington is the second listed inventor in the Justheim reference. Therefore, where discussion of “Huntington” is encountered in the record, the Examiner and Appellants are in actuality referring to the Justheim reference. Appellants correctly refer to the Justheim reference in the Reply Brief.

Claims 215 and 273 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Benson and Justheim.

#### ANALYSIS

*The rejection of claims 213, 214, 220, 222, 226, 228, 237, 239, 240, 243 and 272 as anticipated by Benson*

Each independent claim (claims 213 and 272) recites a method of operating a nuclear fission reactor fuel assembly. App. Br. 45, 50, Claims App. Claims 213 and 272 further recite the limitation of a fuel foam “defining a plurality of interconnected open-cell voids within” the fuel foam. App. Br. 45, 50, Claims App. Appellants’ Specification provides the following definition: “the terminology ‘open-cell voids’ means that each void is typically connected to one or more [of its] neighbors, permitting gas, liquid, or fluid to directly travel between [the] voids [].” Spec. 10; *see also id.* at Fig. 5.

The Examiner relies on Benson for disclosing nuclear fuel foam 12 defining interconnected open-cell voids 22. Final Act. 4–7; *see also* Ans. 3; Benson, Figs. 1–3. Benson describes reference numerals 12 and 22 as follows:

As shown in FIGURES 2 and 3, a core sub-element 12 has essentially a disc form with the upper and lower surfaces respectively 12A, 12B dished or curved so that the centers are closer to each other than the outer edges. A hole 20 is made through the center of the core sub-element.

Benson, col. 2:41–46 (emphasis omitted).

Each core sub-element [12] has randomly dispersed over the surface thereof a plurality of small holes 22 or micropores which are formed during fabrication. The core sub-elements [12] are stacked one on top of another so that their center openings 20

form a continuous passage from the top to the bottom of the core element 10. The edges of adjacent sub-elements [12] are in contact with one another and fuse with heat to seal and define a small chamber between sub-elements. The small micropore openings 22 open into the dished regions or chambers between the core sub-element [12] and which can communicate with the center opening 20 forming a passage through the core element 10.

Benson, col. 2:52–63 (emphasis omitted).

As argued by Appellants: “the cited structure of Benson, specifically reference numbers 12 and 22, have nothing to do with ‘a nuclear fuel foam defining a plurality of interconnected open-cell voids within the nuclear fuel foam.’” App. Br. 29. Appellants further contend:

The passage ways defined by the Benson system are formed via mechanical positioning of sub-elements and the structuring of a “center opening 20” and the “dished regions or chambers” between sub-elements, which is shown in Figures 1-3 of Benson.

In contrast, the “plurality of interconnected open-cell voids” of Appellants’ Claim 213 are defined within the “nuclear fuel foam” and are not formed by mechanically aligning and stacking “sub-elements” and/or forming “dished regions or chambers.”

App. Br. 30; *see also* App. Br. 23–24.

Appellants further note:

[T]he **holes 22** within any single core subelement 12 [of Benson] are **not interconnected** and the volatile fission products generated by a subelement 12 are transported **out** of the subelement 12 **by diffusing out of the holes 22** - not transported between or among the holes 22 in the fuel [subelement] 12.

Reply Br. 5.

Appellants’ arguments are persuasive. Benson’s micropores or holes 22 are not “interconnected open-cell voids” as claimed in that there is no

indication that they are connected to their neighbors, thereby permitting gas, liquid, or fluid to directly travel between the voids. *See* Spec. 10. In contrast, Benson’s micropores or holes 22 diffuse fission products to the central opening 20 of the core sub-elements 12 where the fission products are removed by a purge gas flowing through the opening 20. *See* Benson, 2:52–3:3. That is, the micropores or holes 22 communicate with the dished areas and central opening 20 of core sub-elements 12, but not with each other.

Accordingly, based on the record presented, and for the foregoing reasons, we do not sustain the Examiner’s rejection of claims 213, 214, 220, 222, 226, 228, 237, 239, 240, 243, and 272 under 35 U.S.C. § 102(b) as anticipated by Benson.

*The rejection of claims 215 and 273  
as unpatentable over Benson and Justheim*

As for dependent claim 215 (which depends from claim 213 and therefore incorporates all of the limitations thereof) and independent claim 273, they stand rejected as being unpatentable over Benson and Justheim. Final Act. 7. Claim 273, like claim 213 discussed *supra*, also includes the limitation of a fuel foam “defining a plurality of interconnected open-cell voids within” the fuel foam. As noted above, Benson lacks interconnected open-cell voids and Justheim fails to cure this deficiency in the Benson reference. Appellants correctly note the Justheim reference and the Examiner’s reliance thereon for disclosing “a plurality of spatially distributed void cells (12).” Final Act. 7; *see also* Appeal Br. 34.

Appellant also notes that the cells 12 of Justheim et al. are all ***closed*** cells. *See* U.S. Patent No. 3,028,330 [Justheim], FIGs. 1 and 3-7 (reference no. 12). Also, none of the cells 12 of Justheim

et al. are interconnected. Thus, **the unconnected closed cells 12 of Justheim et al. are not interconnected open-cell voids.**

That is, Justheim et al. teaches a plurality of unconnected closed cell voids, each individual unconnected closed cell containing an individual fragment of fissionable material.

Reply Br. 8.

Hence, Justheim teaches closed, unconnected cells 12 in matrix 10, which cells contain fragments of fissionable material. Neither Benson nor Justheim discloses a nuclear fuel foam defining a plurality of interconnected open-cell voids within the nuclear fuel foam as called for in dependent claim 215 and independent claim 273.

Accordingly, based on the record presented, and for the foregoing reasons, we do not sustain the Examiner's rejection of claims 215 and 273 under 35 U.S.C. § 103(a) as unpatentable over Benson and Justheim.

#### DECISION

The Examiner's rejections of claims 213–215, 220, 222, 226, 228, 237, 239, 240, 243, 272, and 273 are reversed.

**REVERSED**