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File Number: T 355/90 - 3.2.3  
Application No.: 86 300 807.4  
Publication No.: 0 191 602  
Title of invention: Microtube strip (MTS) heat exchanger

Classification: F28D 7/16

D E C I S I O N  
of 20 May 1992

Applicant: Doty, Francis David

Headword: Heat exchanger/DOTY

EPC Articles 109(1), 111(1)

Keyword: "Substantially amended claims filed with Statement of Grounds of Appeal" - "Remitted to Examining Division"

Headnote



Case Number : T 355/90 - 3.2.3

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.3  
of 20 May 1992

**Appellant :** Doty, Francis David  
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**Representative :** Eyles, Christopher Thomas  
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**Decision under appeal :** Decision of Examining Division of the European Patent Office dated 7 November 1989, dispatched in writing on 4 December 1989 refusing European patent application No. 86 300 807.4 pursuant to Article 97(1) EPC.

**Composition of the Board :**

**Chairman :** F. Brösamle  
**Members :** H. Andrae  
J.-C. Saisset

## Summary of Facts and Submissions

- I. European patent application No. 86 300 807.4 filed on 6 February 1986 and published under No. 0 191 602 was refused by decision of the Examining Division on 7 November 1989, dispatched in writing on 4 December 1989. The decision was based on Claim 1 as amended during oral proceedings before the Examining Division and Claims 2 to 7 filed by letter of 27 February 1989 according to the main request. According to a subsidiary request, the independent Claim 1 incorporated the features of the above-cited Claims 1 and 2.
- II. The reason given for the refusal was that the subject-matter of the claims according to the main request and the subsidiary request is not patentable in the light of the disclosure of US-A-3 782 457 and GB-A-1 141 102 having due regard to the requirement of an inventive step.
- III. On 30 January 1990, a notice of appeal was filed by telex, confirmed by letter received on 31 January 1990, and the appeal fee duly paid. By telex of 10 April 1990, confirmed by letter received on 11 April 1990, the Appellant filed a Statement of Grounds of Appeal together with a new set of Claims 1 to 3 and requested that the Board of Appeal set aside the contested decision and grant a patent on the basis of the new set of claims. In the Statement of Grounds of Appeal, the Appellant refuted the reasoning of the decision under appeal.
- IV. Claim 1 now reads as follows:
- "1. A gas-to-gas heat exchanger module comprising an array of metal tubes (1), each having an outside diameter of less than 3 mm and a length not exceeding 300 times their outside diameter, disposed in parallel and arranged

in parallel planar rows, inlet and outlet ends of the tubes being sealingly secured into respective rectangular inlet and outlet header strips (2) to communicate through passages therein with respective inlet and outlet manifold means (3, 4) for the passage of gas through the tube side of the module; and means (5) to define a counterflow path for shell side gas; characterised in that said tubes are hardened, are without heat transfer augmentation means, are an interference press fit and diffusion welded into the header strips and are of sufficient length to promote fully developed laminar flow of both the tube side and shell side gases, the number of tubes in each row is at least twice, and preferably considerably greater than twice, the number of rows, and the axis of each tube in each row is spaced from that of each adjacent tube in the row by a distance between 1.3 and 2.8 times the tube outside diameter whereby counterflow for shell side gas is provided over substantially the whole length of the tubes."

**Reasons for the Decision**

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is admissible.
  
2. The Appellant has made it clear in the Statement of Grounds of Appeal that he no longer requests that a European patent be granted containing claims as previously examined and refused by the Examining Division; instead he requests that a patent containing an amended set of claims be granted.

An examination of these claims with regard to the question of whether the European patent application has been amended in such a way that it contains subject-matter

which extends beyond the content of the application as filed reveals the following:

Claim 1 is based on the originally filed Claim 1, a number of additional features being, however, incorporated, namely

- (a) the feature that the heat exchanger is a gas-to-gas heat exchanger is based upon page 1, paragraph 1 (cf. "single phase fluids ...") of the original description;
- (b) the feature that each metal tube has a length not exceeding 300 times the outside diameter of the tube, the tubes being disposed in parallel and arranged in parallel planar rows, can be derived from page 12, paragraph 3 and Figures 1 and 2 of the original description and drawings, respectively;
- (c) the features that the inlet and outlet ends of the tubes are sealingly secured into respective rectangular inlet and outlet header strips to communicate through passages therein with respective inlet and outlet manifold means for the passage of gas through the tube side of the module, the tubes being an interference press fit and diffusion welded into the header strips, can be derived from page 15, last paragraph to page 16, paragraph 3 of the original description in combination with Figures 1 and 3 of the original drawings.
- (d) the features that the tubes are hardened and are without heat transfer augmentation means are based on paragraph 3 of page 12 and paragraph 1 of page 1, respectively, of the original description;

- (e) the feature that the tubes are of sufficient length to promote fully developed laminar flow of both the tube side and shell side gases, is based on page 10, last line, to page 11, lines 1 to 5 of the original description;
- (f) the feature that the number of tubes in each row is at least twice, and preferably considerably greater than twice, the number of rows, can be derived from the combined information given on page 13, lines 13 and 14 and on page 15, lines 16 and 17 of the original description;
- (g) the feature that the axis of each tube in each row is spaced from that of each adjacent tube in the row by a distance between 1.3 and 2.8 times the tube outside diameter, is based on page 16, paragraph 2 of the original description;
- (h) the feature that counterflow for shell side gas is provided over substantially the whole length of the tubes is based on original Claim 4.

The replacement of the term "metallic microtube" in the original Claim 1 by the term "metal tube" in present Claim 1 is not objectionable since the latter term being complemented by the indication of the tube outside diameter of less than 3 mm is sufficiently clear to define the size of tubes defined by the term "metallic microtube" in original Claim 1.

The fact that the term "cap containing at least one fluid manifold connection" of the original Claim 1 has been replaced by the term "inlet and outlet manifold means (3, 4)" has to be regarded as an acceptable clarification since according to Figure 3 of the original drawings cap

(3) and manifold port (4) form together a unit serving as "manifold means".

The characterising feature of Claim 2 is derivable from page 13, paragraph 1 and page 15, paragraph 3 of the original description together with Figure 1 of the original drawings and the characterising feature of Claim 3 is disclosed on page 4, paragraph 2 of the original description.

Claims 1 to 3 comply therefore with the requirement of Article 123(2) EPC.

3. Claim 1 starts in its pre-characterising portion from the heat exchanger disclosed in document US-A-3 782 457 and differs from this prior art by the following features contained in the characterising portion of Claim 1:

- (A) the tubes are hardened;
- (B) the tubes are without heat transfer augmentation means;
- (C) the tubes are an interference press fit and diffusion welded into the header strips;
- (D) the tubes are of sufficient length to promote fully developed laminar flow of both the tube side and shell side gases;
- (E) the number of tubes in each row is at least twice, and preferably considerably greater than twice, the number of rows;

(F) the axis of each tube in each row is spaced from that of each adjacent tube in the row by a distance between 1.3 and 2.8 times the tube outside diameter;

(G) counterflow for shell side gas is provided over substantially the whole length of the tubes.

4. A comparison of the subject-matter of present Claim 1 with that of the original claims shows that the features (A), (B), (D), (E) and (F) (cf. above point 3) do not form part of any of the original Claims 1 to 10. It is therefore questionable whether the European search has covered the subject-matter of present Claim 1. In addition, present Claim 1 incorporates subject-matter, i.e. the features (A), (B) and (E), also not contained in the claims according to the main and subsidiary requests as examined and refused by the Examining Division. Present Claim 1 has therefore to be regarded as being substantially amended.
5. In previous decisions of the Boards of Appeal (cf. e.g. Decision 562/88 dated 21 November 1989, unpublished, and Decision T 63/86 dated 10 August 1987, OJ EPO 1988, 224) it was decided that cases in which substantial amendments were requested on appeal, should be remitted to the Examining Division for further prosecution. In this way, the Appellant is put in a position to appeal to a second instance in relation to the formal and substantive allowability of the amended claims.
6. In the circumstances of this case, the Board has accordingly decided to exercise its power under Article 111(1) EPC to remit this case to the Examining Division for further examination since the Examining Division has not allowed interlocutory revision and since an additional search for the features not claimed up to now appears to be necessary.

The subsidiary request of the Appellant for oral proceedings is without object since the Board has complied with the first request of the Appellant to cancel the decision to refuse the application and since formal and substantive examination is the duty of the first instance.

**Order**

For these reasons, it is decided that:

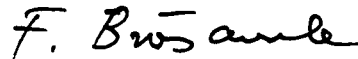
1. The contested decision is set aside.
2. The case is remitted to the first instance for further prosecution in relation to the proposed amendments filed by letter received on 11 April 1990.

The Registrar:



N. Maslin

The Chairman:



F. Brösamle

