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|---|---|
| Veröffentlichung im Amtsblatt | Ja/Nein |
| Publication in the Official Journal | Yes/No |
| Publication au Journal Officiel | Oui/Non |

Aktenzeichen / Case Number / N° du recours : T 460/89 - 3.2.3

Anmeldenummer / Filing No / N° de la demande : 84 306 329.8

Veröffentlichungs-Nr. / Publication No / N° de la publication : 0 138 401

Bezeichnung der Erfindung: Gas/liquid contact device
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : F28F 25/08

## ENTSCHEIDUNG / DECISION
vom / of / du 6 August 1990

Anmelder / Applicant / Demandeur : Wigley, Albert Frederick

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence : Contact device/Wigley

EPÜ / EPC / CBE Article 56 EPC

Schlagwort / Keyword / Mot clé : "Inventive step (yes)"

**Leitsatz / Headnote / Sommaire**

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Case Number : T 460/89 - 3.2.3

# D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 6 August 1990

Appellant : Wigley, Albert Frederick
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Decision under appeal : Decision of Examining Division 074 of the European Patent Office dated 16 February 1989 refusing European patent application No. 84 306 329.8 pursuant to Article 97(1) EPC

Composition of the Board :

Chairman : C.T. Wilson
Members : H. Andrä
J.-C. Saisset

**Summary of Facts and Submissions**

I. European patent application No. 84 306 329.8, filed on 17 September 1984 and published on 24 April 1985 (publication No. 0 138 401), was refused by a decision of Examining Division 074 dated 16 February 1989.

II. The decision was based on Claims 1 to 6 received on 7 January 1988.

The reasons given for the refusal were that Claim 1 contained subject-matter which extends beyond the content of the application as filed. On the other hand, an independent claim formulated by the Examining Division which did not contain subject-matter extending beyond the content of the application as filed would not involve an inventive step having regard to the prior art disclosed in GB-A-1 351 605 and in US-A-3 485 485.

III. On 15 April 1989 the Appellant lodged an appeal against the decision. The appeal fee was duly paid and the statement of grounds was received on 25 May 1989 together with a new set of Claims 1 to 6 and new pages 1 to 3 and 3a of the description.

The Appellant argued that reference is no longer made in Claim 1 to guide surfaces, but only to angled projections such that the reason for refusal of the application concerning extended subject-matter was not applicable. With regard to the second reason for refusal, i.e. lack of an inventive step of Claim 1, the disclosures of GB-A-1 351 605 and US-A-3 485 485 would be incompatible with one another since the latter was concerned with a cooling screen and not with a device having tubular cells.

IV. After consultation by telephone between the Rapporteur and the Representative concerning formal requirements of the application, the Appellant filed, by letter of 19 June 1990, an amended page 1 of the description which replaces page 1 of the description as filed on 25 May 1989.

The Appellant requests grant of a patent on the basis of the new documents together with original pages 4 and 5 of the description and original pages 1/4 to 4/4 of the drawings.

V. Subsisting Claim 1 reads as follows:

"1. A gas-liquid contact packing device for enabling a film of liquid and a gaseous stream to be brought into contact to effect heat exchange therebetween, the pack comprising a plurality of sheets (8) each of which is continuously corrugated to define a plurality of parallel depressions (9) and is assembled with similar sheets to define a plurality of parallel tubular cells (16) of substantially constant cross section, the cells (16) being provided with angled projections (14) arranged to impart rotary motion to the gas stream and the cells being formed with transverse ribs (13) which form channels which interconnect adjacent cells to permit liquid flow between the cells, characterised in that the depressions (9) in each sheet (8) are V-shaped in cross section and have side walls (10) which meet the side walls (10) of adjoining depressions (9) in the same sheet to provide rectilinear crests (12) which meet the crests (12) of adjacent sheets (8) in substantially line contact, forming cells (16) of substantially rectangular cross section."

**Reasons for the Decision**

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is admissible.

2. Present Claim 1 in its substance is a combination of the features of original Claims 1, 4, 7 and 12 whereby the following features have been additionally incorporated in Claim 1:

   (a) the feature that the depressions (9) in each sheet (8) have side walls (10) which meet the side walls (10) of adjoining depressions (9) in the same sheet to provide rectilinear crests (12) which meet the crests (12) of adjacent sheets (8) in substantially line contact (see disclosure on page 4, paragraph 2, of original description).

   (b) The feature that the transverse ribs (13) form channels which interconnect adjacent cells to permit liquid flow between the cells (see disclosure on page 5, paragraph 2 of original description).

   (c) The feature that the cells are provided with angled projections (14) arranged to impart rotary motion to the gas stream (see disclosure on page 5, lines 9 to 13 of original description).

   (d) The features that the tubular cells (16) are of substantially constant cross section and that the crests (12) formed by the side walls (10) of the depressions (9) in each sheet are rectilinear (see disclosure in Figures 1, 2 and 7 of the original drawings).

Claim 2 is a combination of the features of original Claims 8 and 9, Claim 3 is a combination of the features of original Claims 2 and 3, Claims 4, 5 and 6 are identical to original Claims 6, 10 and 11, respectively.

The claims, therefore, meet the requirement of Article 123(2) EPC.

3. After examination of the citations revealed in the search report, the Board is satisfied that none of them discloses a gas-liquid contact packing device including all the features stated in Claim 1. Since this has not been disputed in the reasons for the decision under appeal there is no need for further detailed substantiation of this matter. Therefore, the subject-matter as set forth in Claim 1 is novel (Article 54 EPC).

4. The precharacterising portion of the new amended independent Claim 1 comprises only features also disclosed in combination in the closest prior art as reflected by GB-A-1 351 605 (1).

5. In the packing device known from (1), a plurality of sheets are provided, each of which is continuously corrugated to define a plurality of parallel depressions and is assembled with similar sheets to define a plurality of parallel tubular cells of substantially constant hexagonal cross section. The adjacent packing sheets are in surface to surface contact over a substantial portion of their total area. At the joining portions, which are of double thickness as compared with the other sides of the hexagonal cell structure, the total cell surface area available for gas-liquid contact is reduced.

6. The problem to be solved by the application, therefore, resides in providing a gas-liquid contact packing device of

the kind described in the preamble of Claim 1, which more efficiently utilises the available area of the parallel tubular cells for gas-liquid contact.

7. The solution of the problem underlying the application is based on the idea of modifying the joining portions of adjacent tubular cells such that instead of surface to surface contact, substantially line contact is provided. The term "in substantially line contact" as disclosed originally (see preceding paragraph 2(a)) has to be interpreted in the light of the description and drawings (Article 69(1) EPC). It arises therefrom that the lines of join of the crests and valleys of the sheets forming the tops and the bottoms of the saw-tooth corrugations, do not represent complete straight lines in the geometrically exact meaning but are interrupted by reason of the presence of small transverse sinusoidal ribs which serve the purpose of preventing liquid overload of any tubular cell by transmission of excess liquid to the adjacent tubular cells.

8. It is now to be investigated whether the subject-matter according to Claim 1 involves an inventive step.

8.1 The utilisation of the surface area available for heat exchange contact in a heat transfer device to the greatest possible extent must be considered as the normal task of the skilled person. Therefore, no contribution to the inventive step of the solution may be seen in the perception of the problem as indicated in paragraph 6.

8.2 The question now has to be answered whether the prior art, taking into account the common knowledge of the skilled person, would provide any indication as to how the available area of the parallel tubular cells may be utilised more efficiently for gas-liquid contact.

8.3 US-A-3 485 485 (2), which was considered by the Examining Division to suggest the idea of tubular cells of substantially rectangular cross-section between adjacent sheets, discloses a gas-liquid contact packing device comprising a plurality of sheets each having a wavelike configuration in the longitudinal as well as in the transverse direction. Due to aligning the ridge of a corrugation of a given sheet with the valley of a corrugation of an adjacent sheet, there is substantially point contact between two adjacent sheets in distances depending upon the wavelength of the wave-like configuration in longitudinal and transverse direction. Thus, a cooling screen is formed which is open in transverse and in longitudinal direction such that there is no suggestion either of parallel tubular cells of substantially constant cross section or of rectilinear crests which meet the crests of adjacent sheets in substantially line contact.

The Board considers, the skilled person faced with the problem of utilising more efficiently the available area of the parallel tubular cells for gas-liquid contact would not consider the disclosure of (2) for possible solutions since (2) does not provide a plurality of parallel tubular cells formed by cooperating rectilinear crests, but concerns a cooling screen open in two perpendicular directions.

If the teachings of (1) and (2) were nevertheless combined, the basic concept of a packing device having a plurality of parallel tubular cells for effecting heat exchange would have to be abandoned, which would be in contrast to the claimed solution.

8.4 Having regard to the remaining documents cited in the search report, which have not been introduced into the proceedings by the Examining Division, the following comments are given:

8.4.1 US-A-3 952 077 (3) is based upon the application underlying GB-A-1 351 605 (1). The comments given with regard to (1) apply, therefore, equally to (3).

8.4.2 FR-A-2 386 008 (4) discloses a gas-liquid-contact packing device comprising a plurality of corrugated sheets to define parallel approximately V-shaped depressions which when assembled provide rectilinear crests which meet the crests of adjacent sheets in substantially point contact. Furthermore, the sheets are not assembled with similar sheets in a manner to define parallel tubular cells of substantially constant cross-section due to the fact that the crests of adjacent sheets are arranged with their longitudinal axes orthogonal to each other. Thus, the crests of adjacent sheets do not meet in substantially line contact, either.

8.4.3 US-A-3 540 702 (5) and FR-A-2 255 568 (6) each disclose a gas-liquid contact packing device comprising a plurality of corrugated sheets to define parallel approximately V-shaped depressions. The sheets are assembled in the packing device by means of seats forming substantially point contact betwen adjacent sheets. Flow of gas and liquid is possible in all directions parallel to the sheet planes such that there is not defined a plurality of parallel tubular cells of substantially constant cross-section nor is there provided substantially line contact between the crests of adjacent sheets.

Summing up, the prior art according to the remaining documents (4), (5) and (6) does not give a lead to the gas-liquid contact packing device of Claim 1 either, since these devices define cooling screens and do not provide a plurality of parallel tubular cells of substantially constant cross section.

8.5 Hence, it is considered that the subject-matter of Claim 1 would not be obvious from the prior art relied on by the Examining Division and the remaining citations revealed in the search report.

The subject-matter of Claim 1 thus also meets the requirement of Article 56 EPC with respect to inventive step.

9. The dependent Claims 2 to 6, having as subject-matter preferred embodiments of the invention as claimed in Claim 1, are also allowable, since their acceptance is supported by that of Claim 1.

10. Having regard to the amendment of the description on page 3a, the last two sentences in the last paragraph on page 3 of the originally filed description have been left out, removing thereby reference to a possible cross-flow system in which the sheets are spaced apart to leave gaps between the sheets. Since subsisting Claim 1 is limited to a configuration of the packing device in which cross-flow due to substantially line contact between the crests of adjacent sheets is not possible, the above amendment to page 3a of the description has to be regarded in the view of the Board as a necessary clarification to comply with the requirements of Rule 27(1)(d) EPC.

**Order**

**For these reasons, it is decided that:**

1 The decision under appeal is set aside.

2. The application is remitted to the first instance with the order to grant the patent on the basis of the following documents:

Claims: 1 to 6 received on 25 May 1989
Description: page 1 received on 25 June 1990
pages 2, 3 and 3a received on 25 May 1989
pages 4 and 5 as originally filed
Drawings: sheets 1/4 to 4/4 as originally filed.

The Registrar: The Chairman:

S. Fabiani C.T. Wilson

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