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**Datasheet for the decision
of 27 October 2009**

Case Number: T 0538/07 - 3.2.03

Application Number: 99948628.5

Publication Number: 1131588

IPC: F25J 3/06, F25J 3/00

Language of the proceedings: EN

Title of invention:
Method and Apparatus for liquefying a gas

Patentee:
Translang Technologies Ltd.

Opponent:
Shell Internationale Research Maatschappij B.V.

Headword:
-

Relevant legal provisions:
EPC Art. 123(2)

Relevant legal provisions (EPC 1973):
-

Keyword:
"Extension of subject-matter (yes)"

Decisions cited:
-

Catchword:
-



Case Number: T 0538/07 - 3.2.03

DECISION
of the Technical Board of Appeal 3.2.03
of 27 October 2009

Appellant: Translang Technologies Ltd
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Alberta T2P 3Y6 (CA)

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Respondent: Shell Internationale Research Maatschappij
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Representative: Peereboom, Jan Hendrik Pieter Jacob
Shell International B.V.,
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 2 February 2007
revoking European patent No. 1131588 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: U. Krause
Members: C. Donnelly
K. Garnett

Summary of Facts and Submissions

- I. The appeal lies from the decision of the opposition division, posted on 2 February 2007, to revoke European Patent No. EP-B-1131588.

The opposition division held that the subject-matter of claims 1 as granted, and of the first and fourth auxiliary requests filed during the oral proceedings infringed the requirements of Article 123(2) EPC. It also held that the subject-matter of claim 1 of the second and third auxiliary requests filed during the oral proceedings was not new with respect to document JP-2-17921 (see English translation) (D1).

- II. The patent proprietor (hereinafter "the appellant") filed a notice of appeal on 30 March 2007 paying the fee on the same day. The grounds of appeal were filed 12 June 2007 together with sets of claims according to the main request and auxiliary requests 1 to 5.

- III. The appellant filed the following documents in support of its case:

Annex 7: CFD for Supersonic Gas Processing, Multiphase Separation and Multiphase Pumping Technologies

Conference 1 to 2 September 2005, Bart Prast et al;

Annex 8: Encyclopedia of Applied Physics, Vol. 1, edited by George L. Trigg, VCH Publishers, page 339;

Annex 9: Espacenet Abstract for D1;

Annex 10: Independent translator's comments on opponent's translation of D1;

Annex 11: Certified translation of D1.

IV. The opponent (hereinafter "the Respondent") replied to the appellant's case by letter of 14 March 2008. In support of its case under Article 100(a) EPC reference was made to the following documents:

- D1: JP2-17921 and an English translation thereof;
- D2: SU-A-1 768 242;
- D3: EP-A-1 017 465;
- D4: "Gas-Solid Operations and Equipment", Section 17, pages 17-1 and 17-19 to 17-32, by Mel Pell and James B. Dunson, 7th edition, 1997 of Perry's Chemical Engineer's Handbook.
- D5: WO-A-97/46 304
- D6: US-A-3 528 217
- D7: "The Dynamics and Thermodynamics of Compressible Fluid Flow"- Vol. 1, pages 242 to 243, Ascher H. Shapiro, publ. 1953.
- D8: US-A-3 902 876;
- D9: English translation of Russian patent 2137065;
- D10: English translation of Russian patent 2133137;
- D11: English translation of Russian patent 2139480;
- D12: English translation of Russian patent 2139479;
- D13: English translation of Russian patent application no. 99102186;
- D15: "Gas conditioning and processing" Vol. 1, 8th edition, Chapter 4 "Qualitative phase behaviour" pages 95 to 97, Campbell, J.M. 2001.

The respondent also maintained the objections under Article 100(b) and (c) EPC made during the opposition procedure and attacked the validity of the priority date claimed.

- V. In a communication dated 8 May 2009, pursuant to Article 15(1) RPBA annexed to the summons to oral proceedings, the Board informed the parties of its provisional opinion. In particular the Board indicated that in its initial view, the expression "with consideration to" is not synonymous with "to compensate for" since it has a broader meaning.
- VI. By letter of 8 September 2009 the respondent filed further documents US-A-3546891(D16), US-A-3731463(D17), US-A-4279627(D18) and WO-A-94/20194(D19). With letter of 16 October 2009 the respondent filed further pages 73 to 75, 82 to 87 and 242, 243 of D7. The appellant made no further written submissions.
- VII. Oral proceedings before the Board were held on 27 October 2009. During the proceedings the respondent presented pages 172, 173, 180 and 181 of the Oxford Illustrated Dictionary (2nd edition) in support of its case under Article 100(c) EPC. The respondent also presented copies of documents headed "RU 2139480 C1", "RU2133137 C1", "RU2139479 C1", "RU2137065 C1" together with a copy of an email headed "Hutter, Hans dated 22 October 2009".
- VIII. In conclusion of its case the appellant requested that the impugned decision be set aside and the patent be maintained on the basis of the main, alternatively the first to fifth auxiliary requests filed with the grounds of appeal dated 12 June 2007.

The respondent requested that the appeal be dismissed.

IX. Claim 1 according to the main request reads:

"An apparatus for liquefying a gas, the apparatus comprising:

- (1) means (4) for imparting a swirl component of velocity to a gaseous flow;
- (2) downstream from said swirl generation means (4), a nozzle (5) comprising a convergent nozzle portion (6) connected to the swirl generation means (4) and a nozzle throat (7) and a divergent working section (9) axially aligned with the nozzle throat (7) and having a wall with a divergence angle chosen to compensate for growth of a boundary layer, whereby in use, the gas adiabatically expands downstream from the nozzle throat (7) in the working section (9) to cause condensation of at least some of the gas, thereby generating droplets of condensed gas; and
- (3) a separation means connected to the working section (9) for separating condensed droplets from the gas."

X. The arguments of the parties relevant to the decision can be summarised as follows:

- (a) *Extension of subject-matter, Article 100(c)*
Article 123(2) EPC

Respondent

Claim 1 of the main and auxiliary requests contains the feature that the divergent working section has a wall "with a divergence angle chosen **to compensate for** growth of a boundary layer" whereas the patent application page 10, line 26 indicates that "the working section has a wall with a divergence angle

chosen **with consideration to** the growth of a boundary layer". These two terms have different technical meanings. The term "with consideration to" has a very broad meaning and is not particularly limitative other than that the growth of the boundary layer is to be taken into consideration in some vague manner and to an unspecified extent. On the other hand "to compensate for" has a narrower meaning in that it demands that the growth of the boundary layer should be neutralised by the choice of the divergence angle. Thus, the the term "with consideration to" can be seen as being the genus of which the expression "to compensate for" is a specific example. However, since a general indication does not disclose the specific, Article 123(2) EPC is contravened.

Appellant

The expression "with consideration to the growth of the boundary layer" should be understood within the context of the opening sentence of the paragraph at page 10, lines 22 to 32 of the application which states "The geometry of the subsonic and supersonic (in the case of supersonic nozzle) parts of the nozzle is chosen on requirement of absence of flow separation at the walls".

Further, the passage at page 17, lines 19 to 25 teaches the skilled person that it is unacceptable to have a working regime whereby boundary layer growth in the working section in the supersonic regime causes so much drag that a shock wave is formed. Thus, the skilled person would understand that this effect of boundary

layer growth must be compensated for by the divergence angle of the working section.

Also the passage at page 13, lines 1 to 7 sets out the conditions which determine the shape of the nozzle and indicates that the divergence angle of the nozzle should provide for continuous flow, with the flow attached to the wall of the nozzle i.e. that the divergence angle must compensate for boundary layer growth.

Reasons for the decision

1. The appeal is admissible.
2. Extension of subject-matter Art. 123(2), Art. 100(c) EPC.
 - 2.1 The characteristic of claim 1 according to the main request wherein the divergent working section has a wall with "a divergence angle chosen to compensate for growth of a boundary layer" is not explicitly specified in the application documents as originally filed and first appears in the amended version of claim 15 upon which the International Preliminary Examination Report is based. The originally filed claim 15 merely specifies that the apparatus comprises "a divergent working section".
 - 2.2 The opponent/respondent first raised the objection under Article 100(c) against the above feature in its letter of 1 December 2006, over two years after the filing of the initial notice of opposition. The

- opposition division decided to admit this fresh ground during the oral proceedings held on 4 December 2006, as it was entitled to do under Article 114 EPC.
- 2.3 Since the opposition division has allowed the late filed objection under Article 100(c) into the proceedings, it is no longer a fresh ground of opposition and the Board is also bound to examine it.
- 2.4 According to the impugned decision (see section 6), and as confirmed during the proceedings before the Board, the appellant argues that within the context of the patent the skilled person would understand the term "with consideration to", originally disclosed at page 10, lines 25 to 27, to mean "to compensate for" as now used in claim 1 of the main request. The opposition division reasoned that since the divergence angle "is not an angle which is compared to another angle, but an angle chosen to take into account an effect ... the meaning of compensate as counterbalance does not appear in this case applicable" and, hence, the interpretation of "compensate" as meaning "to avoid a negative effect" should be applied, which is derivable from the application as originally filed.
- 2.5 The Board is not convinced by this argumentation since it mainly relies on arbitrary definitions of each expression without any direct reference to specific supporting passages in the description. Further, it does not address the opponent's point that other effects of the gas flow have to be considered when choosing the divergence angle.

2.6 From a purely literal point of view, as evidenced by reference to standard dictionaries, such as that presented by the respondent during the oral proceedings before the Board, the expression "with consideration to" is not synonymous with "to compensate for". The former means "to bear in mind" without necessarily achieving any specific effect on whatever is being borne in mind (indeed in the presence of a more dominant influence it might even be decided to neglect it), whereas the latter means counterbalancing or neutralising it or even, taking the opposition division's words, avoiding its negative effects. Hence, on a narrow literal interpretation the respondent is correct in arguing that the expression "with consideration to" is a genus of which the term "to compensate for" is a sub-branch. Consequently, setting the divergence angle "with consideration to" the boundary layer might include the case where the divergence angle is chosen "to compensate for" boundary layer growth, but it does not necessarily demand that this particular condition is completely satisfied.

2.7 Thus, in view of this literal difference, the question at issue is whether within the context of the originally filed documents taken as a whole, the term "with consideration to", used at page 10, line 26 would nevertheless inevitably be understood to mean that a divergence is angle chosen "to compensate for" growth of a boundary layer.

2.8 The appellant has indicated some of the key sections of the description for deciding this question. When studying the description, it is to be noted that claim 1 specifies "a nozzle (5) comprising a convergent

nozzle portion (6) connected to the swirl generation means (4) and a nozzle throat (7) and a divergent working section (9)", thus, the working section is part of the nozzle. Accordingly references in the description to "the nozzle" can be read onto the "working section".

- 2.9 The opening sentence of the paragraph at page 10, lines 22 to 32 of the original description, states "The geometry of the subsonic and supersonic (in the case of supersonic nozzle) parts of the nozzle is chosen on requirement of absence of flow separation at the walls". Thus, by specifying that there should be no flow separation at the walls, this passage indicates that boundary layer growth should at least be limited in some way. However, lines 28 to 32 state that the effect of condensation in the working section resulting in a significant decrease in the volumetric gas flow rate should also be taken into account.
- 2.10 The passage at page 17, lines 19 to 25 states that it is unacceptable to have a working regime whereby boundary layer growth in the working section in the supersonic regime causes so much drag that a shock wave is formed. The passage at page 13, lines 1 to 7 indicates that the divergence angle of the nozzle should provide for continuous flow, with the flow attached to the wall of the nozzle.
- 2.11 Thus, taken together, the whole of the paragraph at page 10, lines 22 to 32 and the two passages at page 13 and 17 teach that the geometry of the working section walls should be determined with consideration to both the content of the liquefied component and the

growth of the boundary layer to ensure there is neither flow separation at the walls nor the formation of a shock wave.

2.12 It would not seem possible to divorce the effect of the liquefied component content from that of boundary layer growth on the divergence angle. On the one hand an increase in the liquefied component causes a significant decrease in the volumetric gas flow rate which is equivalent to an increase in the cross-section of working section, and in supersonic flow this causes the value of the Mach number to increase and in subsonic flow to decrease (see page 19, lines 12 to 21). On the other hand a growth of the boundary layer would have a tendency to restrict the free flow area.

2.13 By dint of equation (1) given on page 16 in which the Mach number is included as a parameter, the description comprises an explicit instruction for determining the profile of the nozzle, as expressed by the ratio between output and throat cross-sections which in turn influences the divergence angle as stated at page 16, line 25 to 26 "The divergence angle of the nozzle was to be chosen based on the requirements expressed above". However, since this equation relates to ideal isentropic flow conditions it cannot serve as a basis for any teaching to adjust the flow cross-section or the divergence angle of the nozzle to compensate for any real effect such as boundary layer growth. Nevertheless, if the divergence angle were chosen based on this equation, it would not give a result which would compensate for boundary layer growth but rather for the change in liquefied component content.

2.14 Thus, the feature whereby the divergent working section has a wall with "a divergence angle chosen to compensate for growth of a boundary layer" is not directly and unambiguously derivable from the application documents as originally filed since these teach that, through its effect on the Mach number, the influence of the liquefied component on divergence angle selection is at least as significant as boundary layer growth. Thus, as originally disclosed, the divergence angle is chosen with consideration to the boundary layer growth together with the liquefied component content and not exclusively to compensate for the boundary layer growth.

2.15 Thus, claim 1 according to the main request does not meet the requirements of Article 123(2) EPC.

2.16 Since all of the other auxiliary requests contain this feature they too do not meet the requirements of Article 123(2) EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

Registrar:

Chairman:

A. Counillon

U. Krause