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D E C I S I O N
of 28 November 1997

Case Number: T 0564/96 - 3.3.2

Application Number: 93401784.9

Publication Number: 0578578

IPC: B01F 3/02

Language of the proceedings: EN

Title of invention:
Apparatus and method for mixing gases

Applicant:
SELAS CORPORATION OF AMERICA

Opponent:
-

Headword:
Mixing gases/SELAS

Relevant legal provisions:
EPC Art. 84

Keyword:
"Clarity - yes - parameter well-recognised in the art"

Decisions cited:
-

Catchword:
-



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Boards of Appeal

Chambres de recours

Case Number: T 0564/96 - 3.3.2

D E C I S I O N
of the Technical Board of Appeal 3.3.2
of 28 November 1997

Appellant: SELAS CORPORATION OF AMERICA
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 15 January 1996
refusing European patent application
No. 93 401 784.9 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: P. A. M. Lançon
Members: U. Oswald
J. H. Van Moer

Summary of Facts and Submissions

I. European patent application No. 93401784.9 (publication No. 0 578 578) was refused by a decision of the Examining Division on the grounds of lack of clarity under Article 84 EPC. The decision was based on a set of seven claims, including two independent apparatus claims 1 and 3 and one independent method claim 4. The set of claims was filed in response to a first communication pursuant to Article 96(2) and Rule 51(2) EPC. Claim 1 contains inter alia the following feature:

"1. Apparatus for mixing gases (A) and (B) with each other...

characterized....

(e) in that the cross-sectional areas of conduits (b) and (c) are of a predetermined size to insure turbulent flow of gases (A) and (B) in the conduits to maintain substantially constant flow coefficients for gases (A) and (B), wherein the areas of conduits (b) and (c) are sized to cause the entering gases (A) and (B) to flow with a Reynolds number above about 2000 throughout said turndown range."

II. Having regard to the fact that the Appellant did not give any reasoning as to the necessity to pursue further the application with an amended set of claims containing two independent apparatus claims, both claims defining either functionally or structurally the same means, the Examining Division raised an objection under Rule 29(2) EPC.

As to the lack of clarity under Article 84 EPC, the Examining Division argued mainly that a turbulent flow or a Reynolds number to be achieved in a conduit

depended on physical properties of the flowing medium. Accordingly, these features related to conditions regarding the way of using an apparatus and could not be regarded as features defining unambiguously structural elements of an apparatus.

Furthermore, the Examining Division held that formulations such as a "range from minimum flow rate to maximum flow rate", "considerably increases and decreases" or "from maximum turndown to minimum turndown" did not define clear limitations for the claimed subject-matter.

III. The Appellant lodged an appeal against the decision of the Examining Division and filed on 27 August 1997 a new set of ten claims, including one independent method claim and one independent apparatus claim. Claim 1 reads as follows:

"1. A method for mixing two predetermined gases (A) and (B) with each other so as to maintain a desired gas flow ratio substantially constant over a range extending from a predetermined maximum expected demand to a predetermined minimum expected demand, in a system comprising a metering valve (20) for gas (A), a metering valve (16) for gas (B), and a mixing area (14) located downstream of said metering valves (20, 16), characterized by the following steps:

- (a) controlling pressure of gas (B) upstream of metering valve (16) to make it equal to pressure of gas (A) upstream of metering valve (20);
- (b) pre-adjusting and setting gas (A) metering valve (20) to a specified pressure drop at the system's maximum expected demand;

- (c) adjusting and setting gas (B) metering valve (16) to provide said desired gas flow ratio;
- (d) sizing the conduits (22, 18) through which the two gases (A), (B) approach the corresponding metering valves (20, 16) at dimensions small enough to insure turbulent flow of said gases (A, B) as they enter said valves (20, 16) at said system's minimum expected demand."

Claim 6 relates to a system for mixing at a desired gas flow ratio two predetermined gases (A) and (B) with each other and for embodying and carrying out the method according to any of claims 1 to 5. Claim 6 includes the features (a) to (d) of claim 1 with the formulations being adapted to define an apparatus.

The Appellant took the view that his response to the Examining Division's first communication was well founded and that the decision to refuse the application was not expected at that stage of the procedure and that this would justify a reimbursement of the appeal fee.

Since the new set of claims contained a main claim 1 relating to a method as recommended by the Examining Division and since the claimed features were perfectly clear for one skilled in the art wishing to embody and carry out the method, the claimed subject-matter fulfilled the requirements of Article 84 EPC.

- IV. The Appellant requested that the decision under appeal be set aside, that a patent be granted on the basis of the set of claims 1 to 10 filed with the letter dated 27 August 1997 and that the appeal fee be reimbursed.

Reasons for the Decision

1. The appeal is admissible.
2. The originally filed set of nine claims includes independent claims 1 and 5 relating to an apparatus and a method respectively, for mixing gases (A) and (B). According to the description as originally filed, the invention is partially **illustrated** by reference to air and fuel **exemplifying** the gases (A) and (B). Since there is no basis for the assumption that the claimed apparatus and method is only suitable for mixing air and fuel, the Board considers it allowable to include such features exemplified by reference to air and fuel into an amended set of claims relating in general to gases (A) and (B).

Thus, the newly filed method claim 1 is supported by the originally filed method claim 5 together with the description on page 1, lines 1 to 14; page 9, lines 3 to 7; page 10, lines 14 to 20; page 11, lines 1 to 7 and page 12, lines 3 to 7 as well as Figures 3 to 5 in conjunction with the explanations in the description. The functional limitation which was not present in the set of claims as originally filed, ie "controlling pressure of gas (B) upstream of metering valve (16) to make it equal to pressure of gas (A) upstream of metering valve (20)" finds support on page 3, line 6 up to page 4, line 17, particularly page 3, lines 10 and 11 in conjunction with page 7, lines 6 to 8 and page 9, line 21 to page 10, line 13. In the judgement of the Board, the disclosure on page 9, line 21 to page 10, line 13, relating to the fundamental equations for the mixing tee according to Figure 5, which is a plant scheme within the scope of the invention, shows that a basis exists for the said pressure control. Moreover,

since it is clearly indicated in the description that the method according to the application is intended to overcome the problem that the prior art gas governor cannot set the inlet pressures of the two gases to be precisely equal, there is no basis for the assumption that governor 10 according to Figure 5 has a different function than governor 10 of the prior art mixing tee in Figure 1.

Claim 2 is supported by a combination of originally filed claim 5 (feature (c)) and claims 7 and 8 in conjunction with page 11, lines 2 to 4. Claim 3 is based on claim 9 as originally filed. Claim 4 is based on page 1, lines 5 and 6; line 19 and Figure 5, "arrows" indicating air and fuel flow in conduits 22 and 18 respectively. Claim 5 can be derived from page 12, lines 14 to 23.

Apparatus claim 6 is based on apparatus claim 1 as originally filed together with the description on page 1, lines 1 to 14; page 9, lines 3 to 7; page 10, lines 14 to 20; page 11, lines 1 to 7 and page 12, lines 3 to 7, as well as Figures 3 to 5 in conjunction with the explanations in the description. For the functional limitation which was not present in the set of claims as originally filed, ie "controlling means (10) arranged on said gas (B) supply conduit (18) upstream of said metering valve (16), for controlling pressure of gas (B) to make it equal to pressure of gas (A) upstream of said metering valve (20)", see corresponding references regarding claim 1 in the foregoing paragraph.

Claim 7 is based on claims 2 and 3 as originally filed. Claims 8 and 10 are based on Figures 3 and 4 with corresponding explanations in the description. Claim 9 is based on Figure 5, with corresponding explanations in the description, particularly page 9, lines 16 to 20.

Since the amendments all have basis in the documents originally filed, the requirements of Article 123(2) are satisfied.

3. The present appeal is limited to the issue of the clarity requirements of Article 84 EPC, and specifically whether the refusal of the application was justified on the grounds of the use of a turbulent flow characteristic in an apparatus claim.
- 3.1 The newly filed set of claims contains one independent method claim 1 and one independent apparatus claim 6, which includes a reference to the method according to claims 1 to 5.

The Board notes that claim 1 relates to a method for mixing gases and more generally to a method of carrying out a so-called unit operation in the field of process engineering based on fluid mechanics. To the technologist, fluid mechanics is the entire body of knowledge, theoretical and empirical, quantitative and qualitative, which allows analysis of the performance of complex plant equipment handling moving fluids. At times the technologist's needs are best satisfied by simply defining regimes of flow or by defining an empirical correlation (see, for example *Kirk-Othmer*, "Encyclopedia Of Chemical Technology", vol. 10, 3rd edn. 1980, 582, first paragraph, page 587, "Flow Phenomena"). Since both the characterisation of a flow regime by turbulent flow behaviour and the Reynolds

number representing a correlation for moving fluids in a turbulent status are well-recognised parameters in the field of fluid mechanics, the Board can only conclude that both the reference to conduits having dimensions small enough to ensure turbulent flow of gases and the reference to a Reynolds number must be regarded as a clear definition of fluid behaviour of gases in conjunction with the mixing process according to claim 1.

The Board cannot see any technical background which with regard to the claimed method would justify a *priori* a chemical or physical definition of the gases to be mixed.

Having regard to the fact that in the present case protection is being sought for subject-matter relating to a more general principle in the field of process engineering and that, in the absence of a contradictory wording of the claim, the terms used in claim 1 are sufficiently clear in their context to be understood by skilled workers, there is a *priori* no need to include numerical values for the system's minimum or maximum expected demand in the claim.

- 3.2 The Board notes furthermore that the method according to claim 1 requires only a few apparatus means in order to be carried out, ie two supply conduits, two metering valves for the gases to be mixed, a mixing area and pressure controlling means arranged on the supply conduits.

Newly filed **claim 6** comprises each of those essential means in a **defined system arrangement**. The wording of the claim, "**A system** for ... carrying out the method according to ...", leaves no doubt that protection is being sought for a physical entity such as an apparatus.

In the judgement of the Board, the fact that claim 6 comprises explanations about the function of each of the apparatus means and the function of the system neither renders the claim unclear, nor does it raise the question as to which category the claim relates to.

It is a well-accepted principle that under particular circumstances the essence of a physical entity such as an apparatus cannot be comprehended without taking into account the conditions under which it is operated. Accordingly, the measure that conduits have been sized at dimensions small enough to ensure turbulent flow or to attain a particular Reynolds number of the flows of the gases to be mixed, if being an essential feature of the invention, cannot be left out of consideration.

Although in claim 6 the nature of the combination of apparatus features and functional features covers many possibilities by taking into account the fact that the size of the supply conduits depends on the working conditions of the apparatus, the resulting subject-matter of the claim is broad rather than unclear. The **broadness** of a claim cannot be contested on its own, only **in conjunction with other criteria such as novelty, inventive step or reproducibility**.

4. It follows from the preceding paragraphs that the objection under Article 84 EPC raised by the Examining Division is lacking in substance, and that the appeal should be allowed.

5. However, having regard to the fact that in response to the Examining Division's objection under Rule 29(2) EPC in the first communication, the Appellant proceeded to file a set of claims including two independent apparatus claims without giving any credible reasoning as to the necessity for this, the Board cannot see any procedural violation in refusing the application without sending a further warning.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The request for reimbursement of the appeal fee is refused.
3. The case is remitted to the Examining Division for further prosecution on the basis of claims 1 to 10 filed on 27 August 1997.

The Registrar:

The Chairman:

P. Martorana

P. A. M. Lançon

