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Datasheet for the decision of 17 July 2013

Case Number: T 1872/09 - 3.4.02

Application Number: 03786809.8

Publication Number: 1565709

IPC: G01F1/74

Language of the proceedings: EN

Title of invention:
AN APPARATUS AND METHOD FOR PROVIDING A FLOW MEASUREMENT COMPENSATED FOR ENTRAINED GAS

Applicant:
CiDra Corporation

Relevant legal provisions:
EPC 1973 Art. 54(1), 56

Keyword:
Novelty and inventive step (yes - amended claims)

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Beschwerdekammern
Boards of Appeal
Chambres de recours

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 1872/09 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 17 July 2013

Appellant: (Applicant)	CiDra Corporation 50 Barnes Park North Wallingford, CT 06492 (US)
Representative:	Klunker . Schmitt-Nilson . Hirsch Patentanwälte Destouchesstraße 68 80796 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 18 March 2009 refusing European patent application No. 03786809.8 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman: A. G. Klein
Members: F. J. Narganes-Quijano
B. Müller

Summary of Facts and Submissions

I. The appellant (applicant) lodged an appeal against the decision of the examining division refusing European patent application No. 03786809.8 based on the International application No. PCT/US2003/036848 (published with the International publication No. WO 2004/046660).

In its decision the examining division referred to document

D1: WO-A-0246705

and held with regard to the set of claims of the main request then on file that the claimed invention was not novel and with regard to the sets of claims of the three auxiliary requests then on file that the claimed invention was not novel or did not involve an inventive step.

II. With the statement setting out the grounds of appeal the appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of one of the claim requests on which the contested decision was based.

III. In reply to a communication of the Board and a telephone consultation with the rapporteur of the Board, with the letter dated 29 May 2013 the appellant filed an amended set of claims 1 to 18 replacing the set of claims of the main request and an amended page 4 of the description, and with the letter dated 18 June 2013 the appellant filed amended pages 1, 6, 7, 9, 10, 15, 20, 21, 23 to 25, 27 and 29 of the description.

IV. Independent claims 1 and 13 amended according to the present main request of the appellant read as follows:

"1. An apparatus for measuring a parameter of a process flow flowing within a pipe, wherein the process flow is a mixture including, in addition to the mixture components, an entrained gas component, the apparatus comprising:

a first meter portion (3) for providing a meter measurement signal (7) indicative of a measurement parameter of the flow of the mixture including the entrained gas component propagating through the pipe;

a second meter portion (2) including a sensor for providing a sound measurement signal (5) indicative of the speed of sound propagating within the pipe, the sound measurement signal and at least one of a temperature and a pressure representative of the mixture being indicative of the entrained gas component of the mixture; and

a processor (24) responsive to the meter measurement signal (7), to the sound measurement signal (5) and to said at least one of a temperature and a pressure for providing a compensated meter measurement signal (11) indicative of the measurement parameter of the mixture corrected for the entrained gas component of the mixture in the flow propagating through the pipe, wherein the compensated meter measurement signal is indicative of the measurement parameter of the mixture excluding the entrained gas component."

"13. A method for measuring a parameter of a process flow flowing within a pipe, wherein the process flow is a mixture including, in addition to the mixture components, an entrained gas component, the method comprising:

receiving a meter measurement signal (7) indicative of a measurement parameter of the flow of the mixture including the entrained gas component propagating through the pipe;

receiving a sound measurement signal (5) indicative of the speed of sound propagating within the pipe, the sound measurement signal and at least one of a temperature and a pressure representative of the mixture being indicative of the entrained gas component of the mixture; and

determining on the basis of the meter measurement signal, the sound measurement signal and said at least one of a temperature and a pressure a compensated meter measurement signal (11) indicative of the measurement parameter of the mixture corrected for the entrained gas component of the mixture in the flow propagating through the pipe, wherein the compensated meter measurement signal is indicative of the measurement parameter of the mixture excluding the entrained gas component."

The main request also includes dependent claims 2 to 12 and dependent claims 14 to 18 referring back to independent claims 1 and 13, respectively.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

The Board is satisfied that the application documents amended according to the main request of the appellant comply with the formal requirements of the EPC, and in

particular with the requirements of Article 123(2) EPC. More particularly, current claim 1 is based on claim 1 and dependent claim 2 [bis] as published together with the following passages of the description as published: page 1, lines 22 to 31, page 6, lines 5 to 12, page 6, line 26 to page 7, line 17, page 8, lines 15 to 20, and page 14, lines 20 to 23; independent claim 13 is based on page 2 as published, line 6 *et seq*., and the features of the claimed method correspond essentially to the features of present claim 1; and dependent claims 2 to 12 and 14 to 18 are based on claims 2 to 12 and on claims 4, 6, 8, 11 and 12, respectively.

The description has been amended in order to comply with the requirements of the EPC, and in particular with those set forth in Article 84, second sentence and Rules 27(1) and 35(12) EPC 1973.

3. *Novelty and inventive step*

3.1 Claim 1 is directed to an apparatus for measuring a parameter of a mixture flowing within a pipe, together with an entrained gas propagating through the pipe. One of the essential aspects of the claimed apparatus is the provision of means for correcting the measurement signal indicative of the parameter according to the speed of sound within the pipe and the temperature and/or pressure of the mixture so as to obtain a compensated measurement signal indicative of the parameter of the mixture excluding the entrained gas.

In its decision the examining division held that the subject-matter of claim 1 of the main request then on file was anticipated by the disclosure of document D1 on page 1, second paragraph. According to this

disclosure the sound speed of a mixture flowing in a conduit is directly related to the phase fractions of the components in the mixture, and for this reason measuring the sound speed and the convection velocity of the mixture provides sufficient information to determine the flow rates of each of the components of the mixture when the density and the sound speed of each component are known. According to the document, however, the applicability of this approach is confined to binary mixtures, i.e. to mixtures comprising only two components (page 1, line 8 *et seq*.). The reason for this is that only in the case of binary mixtures the number of unknowns (i.e. the two phase fractions and the two flow rates of the two mixture components) equals the number of available equations (page 1, lines 14 to 20). In the case of mixtures having three or more components (for instance oil, gas and water, see page 1, lines 5 to 8), the number of available equations is insufficient (page 1, lines 5 to 8 and last paragraph) and the document proposes a different mathematical approach for the determination of the flow rates of the different components of the mixture (abstract and page 2, line 1 onwards).

Claim 1 underlying the decision under appeal related to "a mixture including an entrained gas component". This feature has been replaced in claim 1 amended according to the present main request by the feature "a mixture including, in addition to the mixture components, an entrained gas component". The amended claimed subject-matter therefore makes clear that the mixture comprises, in addition to the entrained gas, two or more mixture components, and thus excludes the disclosure of document D1 mentioned above and involving only binary mixtures. In addition, while the mentioned approach is applied in document D1 to the determination

of the flow rates of each of the two components of a binary mixture and is insufficient to enable the determination of the flow rates of the components of a mixture having three or more components, in claim 1 the approach is applied in order to provide a compensated measurement signal indicative of the parameter of a mixture comprising, in addition to the entrained gas, two or more components by correcting the measurement signal for the presence in the mixture of the entrained gas, the compensated measurement signal being indicative of the parameter of the mixture excluding the entrained gas.

Claim 1 amended according to the present main request of the appellant is therefore new over the disclosure of document D1.

The remaining documents on file are less pertinent than document D1.

3.2 As noted above, document D1 discloses the determination of the flow rate of each of the components of a binary mixture flowing in a conduit on the basis of the sound speed of the mixture and proposes a different approach for the determination of the flow rate of the components of a mixture comprising three or more mixture components. In the case of a mixture comprising at least three mixture components, including a gas component, the document acknowledges the adverse effects of the presence of entrained gas (page 3, lines 13 and 14, and the paragraph bridging pages 7 and 8), but there is no suggestion in the document towards processing the measurement signal indicative of a parameter of the mixture including, in addition to the mixture components, the gas component on the basis of the speed of sound propagating within the pipe so as to

correct the measurement signal for the presence of the entrained gas.

The remaining documents on file and considered during the examination procedure are also insufficient to question inventive step of the claimed subject-matter. In particular:

- document US-B1-6354147 discloses the determination of the phase content of a mixture having more than two constituents, including a gas (abstract, paragraph bridging columns 2 and 3, and first paragraph in column 21),
- document US-A1-2002/0095263 discloses the determination of the flow velocity of a fluid within a pipe, the fluid containing a gas (abstract and paragraph [0002]),
- document US-A1-2002/0129662 discloses the determination of the average flow rate of a fluid flow in a pipe, the fluid flow including a gas (abstract and paragraphs [0003], [0004] and [0013] to [0016]),
- document US-A-5285675 discloses the determination of the flow and composition of a mixture of fluids (abstract), and
- document US-A-4080837 discloses the measurement of flow rate and water content of oil-water streams (abstract).

In addition, the disclosure of these documents relies on the value of the speed of sound in the mixture or fluid, but none of the documents address - not even suggest - the correction of a measurement value of a parameter of a multi-component mixture flowing, together with an entrained gas, within a pipe in order to compensate for the presence of the entrained gas as claimed.

3.3 Independent claim 13 is directed to a method for measuring a parameter of a process flow flowing within a pipe and the steps of the claimed method are essentially in one-to-one correspondence with the functional and structural features of the different means of the apparatus defined in claim 1. Accordingly, the assessment of novelty and of inventive step of the apparatus defined in claim 1 carried out in points 3.1 and 3.2 above is readily applicable to the method defined in independent claim 13.

3.4 The Board concludes that the subject-matter of independent claims 1 and 13 as well as that of dependent claims 2 to 12 and 14 to 18 is new and involves an inventive step over the available prior art (Article 52(1) EPC together with Articles 54(1) and 56 EPC 1973).

4. The Board is also satisfied that the application documents amended according to the main request and the invention to which they relate meet the remaining requirements of the EPC within the meaning of Article 97(1) EPC. The Board therefore concludes that the decision under appeal is to be set aside and a patent be granted on the basis of the application documents amended according to the present main request of the appellant.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to grant a patent on the basis of the following application documents:
   - claims: claims 1 to 18 filed with the letter dated 29 May 2013,
   - description: pages 1, 6, 7, 9, 10, 15, 20, 21, 23 to 25, 27 and 29 filed with the letter dated 18 June 2013, page 4 filed with the letter dated 29 May 2013, and pages 2, 3, 5, 8, 11 to 14, 16 to 19, 22, 26 and 28 of the application as published, and
   - drawings: sheets 1/18 to 18/18 of the application as published.

The Registrar: The Chairman:

M. Kiehl A. G. Klein

Decision electronically authenticated