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D E C I S I O N
of 13 July 2006

Case Number: T 0847/04 - 3.4.02

Application Number: 99951278.3

Publication Number: 1133685

IPC: G01L 9/12

Language of the proceedings: EN

Title of invention:

Device for measuring a medium under pressure

Applicant:

Benestad, Harald

Headword:

-

Relevant legal provisions:

EPC Art. 56,82

EPC R. 86(4)

Keyword:

"admissibility of amendments under Rule 86(4) EPC (yes)"

"inventive step (yes)"

"unity of invention (yes)"

Decisions cited:

T 0613/99, T 0377/01, T 0915/03

Catchword:

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Case Number: T 0847/04 - 3.4.02

D E C I S I O N
of the Technical Board of Appeal 3.4.02
of 13 July 2006

Appellant: Benestad, Harald
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Representative: Onn, Thorsten
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 6 February 2004
refusing European application No. 99951278.3
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: A.G. Klein
Members: F.J. Narganes-Quijano
M. Vogel

Summary of Facts and Submissions

I. The appellant (applicant) has lodged an appeal against the decision of the examining division to refuse European patent application No. 99 951 278.3 based on International application No. PCT/NO99/00323 published with the International publication No. WO 00/25102.

In the decision under appeal the examining division referred to documents

D1: US-A-4617606 and

D2: US-A-4587840,

and held that the subject-matter of independent claim 7 did not involve an inventive step (Article 56 EPC) in view of the disclosure of documents D1 and D2, that the inventions defined in independent claims 1 and 7 lacked unity of invention (Article 82 EPC), and that in any case independent claim 7 had been so amended that the claim infringed the requirements of Rule 86(4) EPC.

II. With the statement setting out the grounds of appeal the appellant requested setting aside of the decision under appeal and the grant of a patent on the basis of the set of claims rejected by the examining division or, as an auxiliary request, on the basis of an amended set of claims.

In response to a telephone consultation with the rapporteur, the appellant filed a set of amended claims 1 to 20, amended description pages 1 and 2, and an amended drawing sheet 1/3 replacing the corresponding application documents on file.

III. Independent claims 1 and 7 according to the present request of the appellant read as follows:

"1. A pressure housing, or pressure-resistant flow guide, for a medium (1) at high pressure, said housing or flow guide comprising a device for measuring at least one characteristic parameter of said medium, said device comprising:

at least one capacitive sensor electrode (4, 10, 11) positioned in a passage (3) which is formed transversely through a wall (2) of said housing or flow guide, said electrode (4, 10, 11) being responsive to said at least one characteristic parameter of said medium (1);

an electrical connection (6, 12, 13) positioned in said passage (3) and connected to said at least one sensor electrode (4, 10, 11) in said passage (3); and

a homogeneous glass-ceramic material (5) which extends around the at least one sensor electrode (4, 10, 11) and the electrical connection (6, 12, 13) and extends from the pressure side (2') of the wall (2) and wholly, or partly, through said passage (3) and hermetically seals the passage (3), and anchors said at least one sensor electrode (4, 10, 11) and said electrical connection (6, 12, 13) to the material of the wall (2) and electrically insulates said at least one sensor electrode (4, 10, 11) and said electrical connection (6, 12, 13) from the material of the wall (2) and such a medium (1), when such a medium (1) is in the pressure housing or flow guide."

"7. A pressure housing, or pressure-resistant flow guide, for a medium at high pressure, said housing or

flow guide comprising a device for measuring at least one characteristic parameter of said medium (1), said at least one characteristic parameter being pressure of such a medium (1) or cavitation caused by contaminants in the medium (1) during movement thereof, said device comprising:

at least one capacitive sensor electrode (15) positioned in a passage (3) which is formed transversely through a wall (2) of said housing or flow guide, said electrode (15) being responsive to said at least one characteristic parameter of such a medium (1);

an electrical connection (16) positioned in said passage (3) and connected to said at least one sensor electrode (15) in said passage (3);

a homogeneous glass-ceramic material (14) which surrounds the electrical connection (16) and fully surrounds the at least one sensor electrode (15) or at least a face thereof; and

a reference electrode (17, 22) spaced from the sensor electrode (15) by a dielectric fluid or dielectric element (18, 24) and in galvanic contact with the material of the wall (2);

wherein the homogeneous glass-ceramic material (14) extends from the at least one sensor electrode (15) and partly through said passage (3) towards the side of the wall opposite the medium and hermetically seals the passage (3), and anchors said at least one sensor electrode (15) and said electrical connection (16) to the material of the wall (2) and electrically insulates said at least one sensor electrode (15) and said electrical connection (16) from the material of the wall (2)."

The present request of the appellant includes dependent claims 2 to 6 and 8 to 20 referring back to claims 1 and 7, respectively.

- IV. In support of its requests the appellant essentially submitted that the combination of documents D1 and D2 is not one that the skilled person would use. In addition, the pressure sensor of document D2 is of the resistive type and would not be considered by the skilled person for the combination of documents D1 and D2.

Reasons for the Decision

1. The appeal is admissible.
2. *Amendments*

After due consideration of the amendments made to the application documents, the Board is satisfied that the amendments to the application documents according to the appellant's request comply with the formal requirements of the EPC, and in particular with those set forth in Article 123(2) EPC. In particular, claim 1 is based on claim 1 as published together with the embodiments disclosed in the description as published with reference to Figures 1 and 3; independent claim 7 is based on claim 7 as published together with the passages on page 5, line 28 *et seq.* and page 6, lines 9 to 12 of the description as published and the disclosure of the embodiments of Figures 5 to 7; and dependent claims 2 to 6 and 8 to 20 are based on the

features and the alternatives defined in claims 2 to 16 as published.

Furthermore, the description has been appropriately amended and brought into conformity with the invention as defined in the claims (Article 84 EPC, second sentence and Rule 27(1)(c) EPC).

3. *Independent claim 7 - Rule 86(4) EPC*

Independent claim 7 upon which the decision under appeal was based specified that the "glass-ceramic material [...] fully or partly surrounds the [...] sensor electrode". This feature has been amended in present claim 7 so as to specify that the "glass-ceramic material [...] fully surrounds the [...] sensor electrode or at least a face thereof". In the decision under appeal the examining division held that the claims as published did not mention a sensor electrode that is not completely surrounded by the glass-ceramic material and concluded that claim 7 then on file related to unsearched subject-matter within the meaning of Rule 86(4) EPC.

However, the corresponding independent claim 7 of the application as published and on which the search was based specified that "the glass-ceramic material which [...] surrounds the sensor electrode(s) [...] is homogeneous" without however excluding that the sensor electrode is only partly surrounded by the glass-ceramic material. In addition, the possibility that the sensor electrode is not completely surrounded by the glass-ceramic material was not only not excluded by the formulation of the published version of the claim, but

also implicitly implied by claim 12 as published and dependent on claim 7 and according to which a side of the electrode sensor was "coated with a layer of glass-ceramic material which covers the entire cross-section of the hole or slot, the material being *preferably* [...] uniform with the rest of the homogeneous, glass-ceramic material" [emphasis added by the Board], thus clearly pointing at alternative embodiments encompassed by the subject-matter of claim 7 and in which the sensor electrode is only partly surrounded by the homogeneous glass-ceramic material. In addition, these alternative embodiments of the published claim 7 were explicitly disclosed in - and therefore supported by - the description as published (see Figures 5 to 7 and the corresponding description).

Having regard to the above, the formulation of claim 7 as published implicitly encompassed that the sensor electrode was only partly surrounded by the glass-ceramic material and consequently it has to be assumed that the search also covered a pressure housing with a sensor electrode only partly surrounded by the glass-ceramic material.

The Board concludes that the feature of independent claim 7 referred to by the examining division is deemed to have been covered by the search and that the corresponding amendment does not render the claimed subject-matter "unsearched" within the meaning of Rule 86(4) EPC (see in this respect decisions T 915/03, points 3 and 4 of the reasons, T 377/01, point 3.1, and T 613/99, point 2). Consequently, the Board cannot follow the examining division's view that the amended

claim is inadmissible under Rule 86(4) EPC by virtue of the amendments mentioned above.

4. *Independent claims 1 and 7 - Inventive step*

4.1 During the first-instance proceedings the examining division did not object to the patentability of the subject-matter of claim 1 and dependent claims 2 to 6, and the Board is satisfied that these claims define novel and inventive subject-matter over the available prior art (Articles 52(1), 54 and 56 EPC). In particular, none of the documents on file discloses or suggests a capacitive sensor electrode anchored within the wall of a pressure housing or flow guide by means of a glass-ceramic material encapsulating the electrode and the corresponding electrical connection as claimed.

4.2 In the decision under appeal the examining division held that the subject-matter of independent claim 7 was rendered obvious by the disclosure of document D1 and the teaching of document D2. The Board, however, cannot follow the examining division's finding in this respect for the following reasons.

4.2.1 Document D1 discloses a capacitive pressure transducer comprising a capacitive electrode bonded to a nonconductive substrate and a diaphragm capacitive electrode disposed on the substrate, the diaphragm electrode having a recess portion such that the two electrodes are electrically isolated from each other (Figure 1 together with column 4, lines 4 to 33 and column 6, lines 21 to 30).

Document D2 is directed to a pressure chamber such as a hydraulic pressure line, a vessel, a pipeline, etc., comprising a pressure sensor for measuring the pressure of a fluid medium within the chamber (abstract, column 1, lines 8 to 16 and lines 58 to 64, and column 3, lines 2 to 4). The pressure sensor is of the resistive type (column 2, line 57 to column 3, line 6) and comprises a resistance element and two connecting electrical conductors positioned in a transverse passage of a wall of the chamber and anchored to the wall by means of a sealing insulating homogeneous material extending from the pressure sensor through the passage towards the side of the wall opposite the medium (abstract and Figures 1, 3, 5, 7 and 8 together with the corresponding description).

- 4.2.2 The subject-matter of claim 1 differs from the disclosure of document D1 in essence in
- the provision of the capacitive transducer in a passage of the wall of a pressure housing or pressure-resistant flow guide as claimed,
 - the galvanic contact arrangement between the diaphragm electrode and the material of the wall, and
 - the use of a glass-ceramic material as substrate material.

The subject-matter of claim 7 differs from the disclosure of document D2 in that

- the pressure sensor is of the capacitive type instead of the resistive type and requires a reference electrode in addition to the sensor electrode,

- in all the features relating to the reference electrode, and
- in the use of a glass-ceramic material as sealing insulating homogeneous material.

The capacitive and resistive electrode sensors respectively disclosed in documents D1 and D2 require by their nature different arrangements and in this respect the Board concurs with the appellant's contention that the skilled person would not have considered combining isolated features of the electrode arrangements disclosed in documents D1 and D2. In addition, even if the skilled person would have considered incorporating features of the teaching of document D2 into the arrangement disclosed in document D1 as held by the examining division, he would not have arrived at the claimed capacitive electrode arrangement. In particular, document D1 specifies glass (column 4, lines 5 to 8) and document D2 specifies glass, ceramic and plastics (column 5, lines 61 to 63) as alternative anchoring insulating materials for the sensor electrode; thus, none of the documents discloses specifically the use of a material of the glass-ceramic type as required by the claimed subject-matter and the sealing and electrical effects achieved by the use of this material (page 1, lines 17 to 37 and page 5, lines 6 to 11 of the application as published). In addition, the use of the sensor of document D1 in a passage of a pressure wall as disclosed in document D2 would lead to the diaphragm reference electrode of document D1 being arranged in contact with the non-conductive substrate in which the capacitive electrode is inserted (figures of document D1 and the corresponding description), and not arranged in

galvanic contact with the material of the wall of the pressure chamber in which the encapsulating material of the capacitive electrode is inserted as required by the claimed subject-matter; thus, the combination of documents D1 and D2 would result in an arrangement having capacitive characteristics different from those of the claimed arrangement.

Accordingly, neither the structural nor the functional features of the sensor arrangement defined in claim 7 are rendered obvious by the disclosure of documents D1 and D2 within the meaning of Article 56 EPC.

The Board is also satisfied that none of the remaining documents on file suggests the claimed subject-matter.

4.2.3 Having regard to the above, claim 7 and dependent claims 8 to 20 define patentable subject-matter within the meaning of Articles 52(1), 54 and 56 EPC over the available prior art.

5. *Claims 1 and 7 - Unity of invention (Article 82 EPC)*

The objection of lack of unity raised under Article 82 EPC by the examining division in the decision under appeal was based in essence in the examining division's finding that the subject-matter of claim 7 did not involve an inventive step and that consequently no common inventive concept linking the subject-matter of claims 1 and 7 could be identified.

However, as set out in point 4.2.2 above, the subject-matter of claim 7 involves an inventive step over the available prior art by virtue of the capacitive

arrangement including a capacitive sensor electrode anchored within the wall of a pressure housing or flow guide by means of a glass-ceramic material encapsulating the electrode and the corresponding electrical connection as claimed. In addition, although claim 1 does not specify a reference electrode, claim 1 also includes the aforementioned capacitive sensor electrode arrangement (see point 4.1 above). Thus, claims 1 and 7 have in common technical features which define a contribution over the prior art within the meaning of Rule 30(1) EPC. In these circumstances, the Board cannot follow the examining division's finding that there is no common inventive concept linking the subject-matter of claims 1 and 7 (Article 82 EPC).

6. In view of the above, the decision under appeal is to be set aside. In addition, being satisfied that the patent application as amended according to the present request of the appellant and the invention to which it relates meet the requirements of the EPC (Article 97(2) EPC), the Board, in accordance with Article 111(1) EPC, considers it appropriate to exercise favourably the power within the competence of the examining division to order grant of a patent.

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 1 to 20 filed by letter dated 17 May 2006,
 - description pages 1 and 2 filed by letter dated 17 May 2006 and description pages 3 to 7 as published, and
 - drawing sheets 2/3 and 3/3 filed by letter dated 11 June 2003 and drawing sheet 1/3 filed by letter dated 17 May 2006.

The Registrar:

The Chairman:

M. Kiehl

A. G. Klein