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**Datasheet for the decision
of 30 June 2015**

Case Number: T 0805/11 - 3.4.02

Application Number: 08158367.6

Publication Number: 1962066

IPC: G01F23/296

Language of the proceedings: EN

Title of invention:

Fluid level measurement device

Applicant:

Axsensor AB

Relevant legal provisions:

EPC Art. 56, 84, 123(2)

Keyword:

Added subject-matter (no - amended claims)
Clarity (yes - amended claims)
Inventive step (yes)



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Case Number: T 0805/11 - 3.4.02

D E C I S I O N
of Technical Board of Appeal 3.4.02
of 30 June 2015

Appellant: Axsensor AB
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 25 November
2010 refusing European patent application No.
08158367.6 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairwoman T. Karamanli
Members: F. J. Narganes-Quijano
F. Maaswinkel

Summary of Facts and Submissions

- I. The appellant (applicant) lodged an appeal against the decision of the examining division refusing European patent application No. 08158367.6 (publication No. 1962066).

In its decision the examining division held with regard to the requests then on file that the amended claims contravened the requirements of Article 123(2) and 84 EPC, and that the claimed subject-matter did not involve an inventive step (Article 56 EPC) in view of the disclosure of the following documents:

D1: US-A-4909080
D2: US-B1-6360599
D4: US-A-4933915.

- II. With the statement setting out the grounds of appeal dated 22 March 2011 and sent on 24 March 2011 the appellant submitted an amended set of claims 1 to 8 according to a sole request and requested that the decision under appeal be set aside and a patent be granted. The appellant gave reasons why the objections raised in the decision under appeal were overcome.
- III. In reply to a communication of the Board, the appellant submitted with a letter dated 29 May 2015 an amended description (pages 1, 2, 3a, 3b, 3c, 3d, 3e and 3 to 25) replacing the description of the application as originally filed. The appellant requested that, together with the claims on file, this description and the drawings as originally filed be the basis for the grant of a patent.

IV. Claim 1 amended according to the present request of the appellant reads as follows:

" A device for measuring the level of a fluid (116) in a tank (118) using low frequency acoustic pulses, said device comprising:

- a transducer means (114) for transmitting and receiving acoustic pulses, and

- a waveguide (112) connected to said transducer (114) and arranged to extend into the fluid (116),

said acoustic pulses have a wavelength that is longer than the double diameter of the waveguide, to ensure plane wave propagation,

said waveguide having a reference part (128) arranged to be located above the fluid surface and extending between the transducer and a reference element (26), said reference element (26) being arranged to partially reflect an acoustic pulse from the transducer in order to allow determination of the current speed of sound, characterized in that

said waveguide reference part (128) is helical or has the form of a flat spiral."

The set of claims also includes dependent claims 2 to 7 referring back to claim 1, and claim 8 directed to a level measuring system comprising a device as defined in dependent claims 4 to 7.

Reasons for the Decision

1. The appeal is admissible.
2. *Article 123(2) EPC*

In its decision, the examining division held with regard to claim 1 amended according to the requests then on file that the feature relating to the relationship between the wavelength of the acoustic pulses and the diameter of the waveguide did not satisfy the requirements of Article 123(2) EPC. Claim 1 has been amended according to the present request of the appellant so that the feature regarding the mentioned relationship now reads "said acoustic pulses have a wavelength that is longer than the double diameter of the waveguide". This feature is based on page 20, lines 31 to 35 of the application as originally filed, and consequently this amendment overcomes the objection raised by the examining division.

In addition, the Board is satisfied that the remaining amendments to the claims also comply with the requirements of Article 123(2) EPC. In particular, claim 1 is based on claims 1, 4 and 5 together with the passages on page 3, lines 4 to 6, and page 18, line 33 to page 19, line 27 of the application as originally filed, and claims 2 to 8 are based on claims 2, 3 and 6 to 10 as originally filed, respectively.

The amendments to the description concern the adaptation to the claimed invention (Article 84 and Rule 42(1)(c) EPC) and the acknowledgement of the prior art (Rule 42(1)(b) EPC). The Board is satisfied that these amendments comply with the requirements of Article 123(2) EPC .

3. *Article 84 EPC*

The objections raised under Article 84 EPC by the examining division related to the formulation of some

features present in the sets of claims then on file and to the consistency of the description with the claims. The objected claimed features have been either omitted or appropriately clarified in the present claims, and the description has been brought into conformity with the claimed invention (see point 2 above, last paragraph).

The Board is therefore satisfied that the application documents amended according to the present request of the appellant comply with the requirements of Article 84 EPC.

4. *Inventive step*

4.1 In its decision the examining division held that the claimed invention was rendered obvious by the device disclosed in document D4 constituting the closest state of the art, in combination with the teaching of documents D1 and D2.

4.2 Document D4 discloses a device of the type defined in claim 1, i.e. a device for measuring the level of a fluid in a tank using low frequency acoustic pulses. The device comprises a transducer for transmitting and receiving acoustic pulses and an acoustic waveguide connected to the transducer and arranged to extend into the fluid, and the fluid level is determined on the basis of the transit time required by the pulses to reach the transducer after having been reflected by the fluid surface (D4, abstract, Fig. 1, 5A and 5B together with the corresponding description, and column 2, lines 43 to 59).

4.2.1 Claim 1 requires that, in order to ensure plane-wave propagation, the wavelength of the acoustic pulses is

longer than the double of the diameter of waveguide. Document D4 does not disclose this feature, at least not explicitly. However, document D4 requires low-frequency acoustic pulses in a plane-wave propagation regime (column 2, lines 43 to 49 and 54 to 59) and, in this context, the document expressly teaches away from the use of high-frequency pulses, and more specifically from the use of acoustic pulses having a wavelength equal or less than the diameter of the waveguide (column 2, lines 49 to 54). Therefore, the claimed requirement that the wavelength of the acoustic pulses is longer than the double of the diameter of waveguide is not specifically disclosed in document D4, but - as held by the examining division - it is rendered obvious by the teaching of this document that the wavelength of the pulses should be bigger than the diameter of the waveguide and that the bigger the wavelength in relation to the diameter, the more effective is the plane-wave propagation regime in the device.

4.2.2 Claim 1 further requires that

a) the waveguide has a reference element arranged to partially reflect the acoustic pulses from the transducer in order to allow determination of the current speed of sound, and

b) the waveguide reference part, i.e. the part of the waveguide extending between the transducer and the reference point, is arranged to be located above the fluid surface and is helical or has the form of a flat spiral.

According to the disclosure of the invention in the description of the application as filed, feature a) solves the problem of compensating for variations of the speed of sound along the waveguide due to external factors, such as variations in temperature, by providing

a reference signal in addition to the signal reflected by the fluid (page 1, line 24 to page 2, line 5, and page 18, line 8 to page 19, line 34). This reference signal, however, requires a relatively long propagation path and therefore a relatively long waveguide reference part, and feature b) solves the subsequent problem of improving the compactness of the device (page 14, lines 5 to 8 and lines 26 to 32, page 15, lines 8 to 30, and page 20, lines 9 to 29).

4.2.3 It was already known in the prior art that the speed of sound along the waveguide of a device of the type disclosed in document D4 may vary due to temperature variations, and - as acknowledged in the description of the application, see page 1, penultimate paragraph and page 13, first paragraph - it was also known that these variations in the speed of sound can be compensated in terms of a reference signal induced by a reference point provided in the waveguide, see for instance document D2 (Fig. 1 together with column 2, lines 50 to 63, and column 5, lines 3 to 17) which also relies on plane-wave propagation (Fig. 7 together with column 5, line 55 to column 6, line 27) and mentions the aforementioned technique as a conventional calibration technique (column 2, lines 50 to 63, and column 5, line 4 *et seq.*). In view of these considerations, the Board concurs with the examining division's view that the provision of a reference point in the acoustic waveguide of the device of document D4 for the purposes of compensating for variations in the speed of sound along the waveguide constituted an obvious technical measure for the skilled person, so that feature a) does not involve an inventive step.

4.2.4 The question now arises whether the skilled person, confronted with the subsequent problem of the

compactness of the device resulting from the provision of a reference point in the acoustic waveguide of the device of document D4, would have considered, in an obvious way, solving this problem by means of the distinguishing feature b).

Document D2 already mentions that the reference point should be positioned in the waveguide at a predetermined distance from the receiver but not too close to the surface of the fluid, and acknowledges the problems associated with the positioning of the reference point (column 2, lines 50 to 63). The document, however, proposes the insertion in the waveguide of a series of closed side branch tubes having predetermined tuned resonating acoustics characteristics (Fig. 2 and column 5, line 18 *et seq.*), and the document is silent as to any modification of the linear shape of the waveguide.

Document D1 discloses a device for measuring the level of a fluid in a tank by means of an acoustic waveguide constituted by a guiding pipe (abstract and Fig. 1 together with the corresponding description). The pipe has two sections, a first section having a helicoidal shape and arranged to be positioned within the fluid tank, and a further section having the shape of a flat spiral and arranged outside the tank (pipe sections 9 and 8 in Fig. 1). In view of this disclosure, and in particular of the section of the waveguide having a flat spiral shape, the examining division concluded that it would be obvious for the skilled person to solve the problem mentioned above by shaping the reference part of the waveguide in the form of a flat spiral.

In spite of the structural similarities, however, documents D1 and D4 do not pertain to the same specific technical field. Both documents primarily address the

problem of measuring the level of a fluid in a tank by means of an acoustic waveguide coupled to a transducer, but the documents rely on different measurement techniques. Thus, while - as already set forth above - documents D4 and D2 involve plane-wave propagation of low-frequency acoustic pulses along an acoustic waveguide having a diameter smaller than the wavelength of the pulses, document D1 relies on ultrasonic waves propagating along a waveguide in a different wave propagation regime and teaches explicitly away from the use of plane-wave propagation (column 3, lines 30 to 46 together with Fig. 6). Furthermore, the problem under consideration emerges in the context of the use of a reference point in the waveguide as taught in document D2, and document D1 does not disclose a reference point and the corresponding reference section in the waveguide pipe; it is even questionable whether a reference point of the kind disclosed in document D2 (i.e. a hole in the side wall of the waveguide, see D2, column 2, lines 50 to 63) would operate as such in the wave propagation regime of the device of document D1 (D1, column 3, lines 30 to 46, and column 1, lines 45 to 48). In view of these considerations, the Board does not agree with the examining division's finding that the skilled person, when looking for solutions to the problem mentioned above, would have consulted document D1.

In addition, document D1 does not propose the provision of a section of the waveguide pipe having the form of a flat spiral in order to cope with problems associated with predetermined features of the waveguide itself, but rather to ensure that a predetermined wave propagation distance is maintained between the transceiver and the surface of the fluid when the fluid inside the tank is at a full level (column 1, lines 23 to 36, column 2,

lines 2 to 7 and 60 to 63, and paragraph bridging columns 5 and 6).

Finally, the device disclosed in document D1 is more compact than the device resulting from the combination of documents D4 and D2. However, if the skilled person would have been interested primarily in the compactness of a device for measuring the level of a fluid in a tank by acoustic means, he would then have adopted the device of document D1 as a whole, and the Board does not see why and how the skilled person, without hindsight knowledge of the claimed invention, would have considered extracting a particular aspect of the device of document D1 and combining it with the device of document D4 when modified according to the teaching of document D2.

Having regard to the above, the Board is not persuaded that the skilled person would have first applied the teaching of document D2 to the device of document D4, would then have consulted document D1, and would have subsequently identified in this document a teaching that would have led him to the claimed invention.

- 4.2.5 The remaining documents on file are less pertinent than documents D1, D2 and D4.

- 4.3 In view of the above considerations, the Board concludes that the subject-matter of claim 1, and that of claims 2 to 8 all incorporating directly or indirectly the device of claim 1, is new and involves an inventive step over the available prior art (Articles 54(1) and 56 EPC).

- 5. The Board is also satisfied that the application documents as presently amended 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 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 in the following version:
 - claims 1 to 8 filed with the letter dated 22 March 2011,
 - description pages 1, 2, 3a, 3b, 3c, 3d, 3e and 3 to 25 filed with the letter dated 29 May 2015 and
 - drawings sheets 1/6 to 6/6 of the application as originally filed.

The Registrar:

The Chairwoman:



M. Kiehl

T. Karamanli

Decision electronically authenticated