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Bezeichnung der Erfindung:
Title of invention:
Titre de l'invention : Coriolis-type mass flow meter comprising at least two straight parallel vibrating tubes

Klassifikation / Classification / Classement : G01F 1/80

ENTSCHEIDUNG / DECISION

vom / of / du 27 March 1990

Anmelder / Applicant / Demandeur :

Patentinhaber / Proprietor of the patent /
Titulaire du brevet : Shell Internationale Research Maatschappij BV

Einsprechender / Opponent / Opposant :
01 Danfoss A/S
02 Endress + Hauser GmbH + Co.
03 Flowtec AG

Stichwort / Headword / Référence :

EPÜ / EPC / CBE

Schlagwort / Keyword / Mot clé : "Admissibility of amendments proposed at oral proceedings (no)"; "inventive step (no)".

Leitsatz / Headnote / Sommaire

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Case Number : T 89/89 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 27 March 1990

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Decision under appeal : Decision of Opposition Division of the Europea Patent Office dated 21 December 1988 revoking Europea patent No. 0 119 638 pursuant to Article 102(1) EPC.

Composition of the Board :

Chairman : J. Roscoe
Members : C. Black
C. Payraudeau

Summary of Facts and Submissions

I. European patent No. 0 119 638 was granted on the basis of European patent application No. 84 200 115.8.

The patent comprises 10 claims of which Claim 1, the only independent claim, reads as follows:

"1. Coriolis-type mass flow meter to be used in a flowline, said meter comprising a flow means for having a fluid flow therethrough, characterized in that said flow means is adapted to be vibrated by an exciting means at 50% of the length of the flow means in a direction normal to the flow direction, and comprising means adapted to detect the phase difference occurring between upstream and downstream parts of the flow means at equal distances from the exciting means, when subjected to vibration at a certain frequency, and means adapted to connect the flow means to the flowline, wherein said flow means comprises at least two straight parallel tubes and wherein the tubes are clamped at their ends."

II. The patent was revoked by decision of the Opposition Division on opposition by the Respondents (Opponents 01, 02 and 03), on the ground that its subject-matter did not involve an inventive step having regard to the documents:

US-A-4 252 028 (D6) and
JP-A-57 137 818 (D3).

An English translation (D3') of document D3 was filed by Opponent 03 with his Notice of Opposition and its accuracy was not contested by the other parties.

III. The Appellant (Patentee) lodged an appeal against this decision.

IV. Oral proceedings were held on 27 March 1990, during which the Appellant expressed his intention to submit a new Claim 1 amended in such a way as to better set out the distinctions between its subject-matter and the device disclosed in document D3 by a different partitioning of the claim in a preamble and characterising portion and a clearer definition of the meaning of the last feature of the claim, according to which the tubes are clamped at their ends.

The Appellant regretted not to have been in a position to propose these amendments at an earlier stage of the procedure, but the discussions with the Patentee's technicians had taken too much time to allow him to do so.

The Respondents contested the admissibility of the proposed amendments at this stage of the procedure because they were only of formal nature and because they should have been made earlier, in accordance with the Guidelines for Appellants and their Representatives published in OJ EPO 1989, 395.

After having interrupted the oral proceedings for deliberation, the Chairman announced the Board's decision not to admit the proposed amended Claim 1 into the procedure.

At the end of the oral proceedings, the Appellant requested that the decision under appeal be set aside and that the patent be maintained unamended.

All three Respondents requested that the appeal be dismissed.

V. Appellant's arguments in support of the patentability of the claimed subject-matter can be summarised as follows:

(a) The mass flow meters described in documents D6 and D3 operate according to totally different principles, since in the device of document D6 the mass flow measurement is based on the measurement of a torque force whilst in that of document D3 the value of the mass flow is deduced from a measurement of phase difference.

Accordingly, the skilled person would not have envisaged any combination of the respective technical features of the flow meters disclosed in these documents.

(b) The mass flow meter defined in present Claim 1 is distinguished from the device described in document D3, which admittedly constitutes the nearest prior art, not only in that it comprises at least two straight parallel tubes instead of only one, but also in that it includes only two detectors instead of three, and in that the ends of the straight parallel tubes are clamped to the flow line in which the mass flow meter is mounted, instead of being joined to one another by a common base. Since the present invention does not require any flexible connection with the flow line, or any common base, the sensitivity of the mass flow measurement can be increased.

(c) Finally, circumstantial evidence of the inventive merits of the subject-matter of the patent is afforded by the facts that two of the Opponents, who

actually sell Coriolis-type mass flow meters in accordance with the invention, praise it as the "solution of the gordian knot" in their own advertising material handed over at the oral proceedings, and in that furthermore none of the Opponents, all well-known instrument manufacturers, has ever hit upon the simple solution defined in Claim 1 (cf. the decision T 106/84 - 3.2.1; OJ EPO, 1985, 132).

VI. These arguments were contested by the Respondents, who essentially stressed that the claimed subject-matter was distinguished from the device described in document D6 only in that it comprised straight tubes instead of U-shaped tubes. This modification of the shape of the tubes was however obvious either from document D6 itself, which teaches that the limbs of the U-shaped tubes may be made divergent (column 3, lines 31 to 34) which ultimately results in straight tubes, or from document D3 which clearly describes the advantages of straight tubes over U-shaped tubes as used in conventional Coriolis-type flow meters.

Alternatively, the claimed invention is distinguished over the device disclosed in document D3 only by the addition of a second tube extending parallel to the first, which however was obvious from the teaching of document D6.

Finally, the reference to the solution of the gordian knot in the advertising material submitted by the Appellant was actually directed to the use of straight tubes in a Coriolis-type mass flow meter as was known from document D3, but not specifically to the provision of two parallel tubes, which constituted the only distinguishing feature of the alleged invention. Nor could the Appellant claim to have been the first to find a simple answer to a longfelt

need, since the claimed device was a direct continuation of the teaching of document D3, which had been published not more than six months before the priority date of the present patent.

Reasons for the Decision

1. The appeal is admissible.

2. Admissibility of the amendments to Claim 1 proposed at the oral proceedings.

The amendments, consisting in correcting the two-part form of Claim 1 and clarifying the meaning of its last feature, which were proposed by the Appellant during the oral proceedings, do not have any relevance to the decision to be taken by the Board.

In particular, lack of compliance of the claims with the provisions of Rule 29(1) and Article 84 EPC is no ground for opposition under Article 100 EPC, and the proposed amendments cannot serve either to overcome the only ground of opposition which was still in dispute during the oral proceedings, namely the Respondents' allegation that the subject-matter of the patent did not involve an inventive step in the sense of Article 56 EPC. For, on the one hand, inventive step has to be assessed on the basis of the claimed features considered in combination, independently of whether they occur in the preamble or characterising portion of the claim. On the other hand, in the Board's opinion the question of whether a claim is clear in the sense of Article 84 EPC must be considered in opposition proceedings only if the patent proprietor has made amendments in accordance with Article 102(3) EPC, which was not the case when the amendments under consideration

were proposed. Otherwise, the claim should be understood as it stands, and interpreted, where necessary, in the light of the description and the drawings (cf. the decision T 23/86 -3.4.1, OJ EPO, 1987, 316).

Accordingly, having regard in particular to the principle set forth by the Enlarged Board of Appeal in its decision GR 01/84 (OJ EPO, 1985, 299, point 9 of the Reasons) that the opposition procedure is not designed to be, and is not to be misused as, an extension of the examining procedure, and following also the findings in the decision T 295/87 -3.3.1 (to be published, headnote published in OJ EPO, 1989, No. 10, point 3 of the Reasons) according to which amendments to the text of a granted patent during opposition proceedings should only be considered as appropriate and necessary in the sense of Rules 57(1) and 58(2) EPC and therefore admissible if they can fairly be said to arise out of the grounds of opposition, the Board regards the proposed amendments as inadmissible.

3. Novelty

3.1 Document D3 discloses with reference to its Figure 6 a Coriolis-type mass flow meter to be used in a flow line, said meter comprising a flow means (20) for having a fluid flow therethrough, in which said flow means is adapted to be vibrated by an exciting means (24,26) at 50% of the length of the flow means (D3', page 9, lines 12 to 16) in a direction normal to the flow direction (see the double arrow next exciting means 24 on Figure 6), and comprising means (28A,28B) adapted to detect the phase difference occurring between upstream and downstream parts of the flow means, at equal distances from the exciting means (as is apparent from the drawings and results also from the statement on page 3, lines 4 to 6 of D3' that the outputs for the two detectors are equal when no fluid is flowing),

when subjected to vibration at a certain frequency (ω), and means (inlet port 29A and outlet port 29B) adapted to connect the flow means to the flow line, wherein furthermore the flow means comprises one straight tube which is clamped at its ends (into holding members 21A and 21B fixed to a base member 23; D3', page 9, lines 5 to 9).

Thus, the subject-matter of Claim 1 is distinguished from the device shown in Figure 6 of document D3 in that it comprises two straight parallel tubes instead of one straight tube only.

With respect to the additional distinguishing features relied upon by the Appellant (point V(b) above), the Board can see no significant difference either in the number of detectors, which anyway is not specified in Claim 1, or in the way the ends of the flow means are clamped in the sense of the claim. In particular, both in the flow meter described in the present patent and in that of document D3 two detectors are necessary to detect the vibrations of the straight tube or tubes at equal distances from the vibrating means, and a third detecting means must be provided for determining the phase difference between the outputs of said detectors. In addition, in the device of the present patent, the opposite ends of each straight tube are clamped into respective flanges (3, 3a) which are connected by a tubular portion shown only on Figure 2 and a central member comprising conical ends and which in the description is said to close the space between the tubes (column 2, lines 36 to 39). This mounting, accordingly, is equivalent to the mounting of the straight tubes of document D3 through holding members 21A and 21B and base member 23. In the absence from the specification and drawings of the present patent of any disclosure of a specific means for connecting the ends of the straight

tubes to a flow line, the Board can find no basis in the patent for Appellant's submission that the clamped status of the ends of the tubes recited at the end of Claim 1 distinguishes its subject-matter from the device of Figure 6 of document D3 with respect to the manner in which these ends are connected to the flow line.

3.2 Document D6 describes a Coriolis-type mass flow meter to be used in a flow line (column 1, lines 6 to 17 and column 2, lines 24 and 25), said meter comprising a flow means for having a fluid flow therethrough (Figure 1 references 14, 14'; 18, 18'; 20, 20'; column 2, lines 21 to 25). The flow means is adapted to be vibrated by an exciting means at 50% of the length of the flow means in a direction normal to the flow direction (Figure 1; force coil 24 and magnet 25; column 4, lines 20 and 21).

The flow meter comprises means (Figure 1; sensors 43 and 44, flags 45 and 46) adapted to detect the phase difference occurring between upstream and downstream parts of the flow means at equal distances from the exciting means (Figure 1; column 5, lines 44 to 55), when subjected to vibration at a certain frequency (column 4, lines 22 to 27).

There are also provided means (Figure 1; inlets 15, 15' and outlets 16, 16') adapted to connect the flow means (14,14'; 18,18'; 20, 20';) to the flow line. The flow means comprises at least two parallel tubes (14, 14'; 18, 18'; 20, 20') which are clamped at their ends (column 3, lines 25 to 27: cantilevered or beamlike mounting of the tubes to a fix support).

Thus, the subject-matter of Claim 1 differs from the flow meter according to D6 in that the parallel tubes are straight tubes.

3.3 The remaining documents on file do not come closer to the claimed subject-matter.

3.4 For the above reasons, the subject-matter of Claim 1 is novel in the sense of Article 54 EPC.

4. **Inventive step**

4.1 The nearest prior art is in the Board's opinion constituted by the device disclosed in document D3 with reference to its Figure 6, as was agreed also by the Appellant at the oral proceedings.

The technical problem to which the distinguishing feature of Claim 1, namely the addition of at least a second straight tube to the single tube mass flow meter of document D3, is to improve its capacity to transport large amounts of fluid without unduly increasing the inner diameter of the measuring tube, which would in turn require that the tube length be unduly increased for maintaining a given sensitivity (description of the patent, column 1, lines 16 to 32).

4.2 The mere formulation of the above defined technical problem does not per se positively contribute to the assessment of inventive step, because the problem of avoiding the use of a large flow channel in a Coriolis-type mass flow meter was known in the art, and addressed in particular in document D6 (column 1, lines 13 to 17).

4.3 To this effect, document D6 teaches to define a plurality of flow channels for which the streams can be flowed either in one direction, in which case they are additively measured, or in opposite directions for differential flow measurements (column 2, lines 16 to 32). Straightforward

application of this principle to the Coriolis-type flow meter of document D3, which immediately results in a device in accordance with Claim 1, does not in the Board's view involve an inventive step in the sense of Article 56 EPC.

In particular, contrary to Appellant's submission (point V(a) above), document D6 relates to a mass flow meter which operates on the same principle as the device of document D3, since it also involves mass flow measurement on the basis of the detection of phase differences occurring between the deformations of the flow means upstream and downstream from the exciting means, as is evident from the statement in column 5, lines 51 to 54 of D6, according to which time differences are determined between the instants in which the leading and trailing edges of the respective base legs move through the midpoint plane. In addition, a Coriolis-type mass flow meter including a single U-shaped tube which operates in the same way as that of document D6, except for the fact that it includes only one such tube, is presented in document D3 as "similar" to that comprising a straight tube (Figure 1 and D3', page 2, lines 8 to 11). Accordingly, the skilled person cannot reasonably be expected not to consider prior art documents relating to flow meters including U-shaped tubes such as document D6 when seeking specific improvements to the flow meter type comprising a straight tube disclosed in document D3.

The circumstantial evidence relied upon by the Appellant could not convince the Board that the claimed device involved an inventive step (point V(c) above) either.

For, on the one hand, the advertising material issued by the Appellant's competitors does not, as regards the solution to the Gordian knot, specifically refer to the

multichannel construction of the described flow meter, which is the sole feature of the claimed device to distinguish it from the flow meter of document D3, but to features which have either been made available by this latter document, such as in particular the use of straight tubes and the direct obtaining of mass flow measurements independently of the volume or density of the transported medium, or form no part of the claimed invention, such as the dimensions of, and materials used for, the device.

On the other hand, document D3 was published only six months before the priority date of the present patent. Accordingly, there could not have existed before the date of the invention any **longfelt** want for an improvement in the capacity of the flow meter described in this document to transport large amounts of fluid, which is the objective technical problem addressed by the patent. In contrast to this, in the decision T 106/84 referred to by the Appellant, the Board was persuaded of the existence of a long-standing problem and this was a ground for it to recognise an inventive step in the simple technical solution there under consideration (point 8.6 of the Reasons).

5. For the above reasons, the subject-matter of Claim 1 is not patentable in the sense of Article 52 EPC and, accordingly, the grounds for opposition mentioned in Article 100 EPC prejudice the maintenance of the European patent.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. Beer J. Roscoe