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**Datasheet for the decision
of 22 December 2011**

Case Number: T 1909/08 - 3.2.02

Application Number: 02785665.7

Publication Number: 1509169

IPC: A61F 2/06

Language of the proceedings: EN

Title of invention:

A method of determining the helix angle of a helical formation
for a conduit

Applicant:

Tayside Flow Technologies Limited

Headword:

-

Relevant legal provisions:

EPC Art. 52(2)(a)(d)(3), 54, 56, 83, 84

Relevant legal provisions (EPC 1973):

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Keyword:

"Clarity: yes (after amendment)"

"Sufficiency of disclosure: yes (after amendment)"

"Technical character: yes (after amendment)"

"Novelty: yes (after amendment)"

"Inventive step: yes (after amendment)"

Decisions cited:

-

Catchword:

-



Case Number: T 1909/08 - 3.2.02

D E C I S I O N
of the Technical Board of Appeal 3.2.02
of 22 December 2011

Appellant: Tayside Flow Technologies Limited
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Representative: Arends, William Gerrit
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 15 April 2008
refusing European patent application
No. 02785665.7 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman: M. Noël
Members: C. Körber
J. Geschwind

Summary of Facts and Submissions

- I. On 15 April 2008 the Examining Division posted its decision according to the state of the file to refuse European patent application 02785665.7 under Articles 52(2)(a) and (d), 54, 56, 83 and 84 EPC.
- II. An appeal was lodged against this decision by the applicant by notice received on 13 June 2008. The appeal fee was received on 12 June 2008. The statement setting out the grounds of appeal was received on 22 August 2008.
- III. The appellant requested that the decision be set aside and that a patent be granted on the basis of claims 1 to 6 filed as main request with letter dated 27 May 2011, description pages 1 and 2 filed with letter dated 27 May 2011, and pages 3 to 6 and drawing sheet 1/1 as published. Oral proceedings were requested on an auxiliary basis.
- IV. The following documents are of importance for the present decision:
- D1: US-A-3 313 577
D2: WO-A-00/38591
D3: DE-A-100 56 673
D4: GB-A-409 528
D5: EP-A-1 254 645.
- V. Claim 1 of the main request reads:
- "1. A method of determining the optimum helix angle of a helical formation (4) for a conduit (1), wherein the

optimum helix angle is for minimising turbulent flow and dead spots within flow through the conduit (1), the method comprising specifying the internal dimensions of the conduit (1), characterized by specifying an intended fluid mass flow through the conduit (1); measuring the pressure drop along, and the turbulent kinetic energy in, a conduit (1) with a helical formation (4) at a range of different helix angles, wherein the conduit (1) has the specified internal dimensions and intended fluid mass flow; non-dimensionalizing the pressure drop and the turbulent kinetic energy; and determining the optimum helix angle from plots of curves of the helix angle versus the non-dimensionalized pressure drop and the helix angle versus the non-dimensionalized turbulent kinetic energy."

Claims 2 to 6 are dependent claims.

VI. The appellant's arguments are summarised as follows:

The claims were clear, as required by Article 84 EPC, and the application was in accordance with Article 83 EPC. The claimed method was clearly of technical character and was neither a mere discovery, scientific theory or mathematical method, nor a mere presentation of information. Documents D1 to D5 did not disclose that the helix angles of their helical formations were determined with reference to the pressure drop and the turbulent kinetic energy of the conduits, and there were no grounds for saying that these documents implicitly disclosed the invention. Since there was no disclosure in the prior art that would allow it to be inferred directly and unequivocally that the method

defined in claim 1 had been used, claim 1 was novel. Starting from document D2, the invention addressed the problem of determining the optimum helix angle of the helical formation more readily and quickly, rather than by trial and error, which was laborious because it required the production of a very large number of different test conduits, each having a helical formation with a different helix angle in order to test a good range of different helix angles. None of the cited documents gave a hint towards the solution as defined in claim 1, which was therefore based on an inventive step.

Reasons for the Decision

1. The appeal is admissible.
2. Amendments

Claim 1 is based on original claims 1 and 2 and the original description as published, in particular page 4, lines 24 to 29, and page 5, lines 3 to 12 and 20 to 29. Dependent claims 2 to 6 correspond to original claims 5 to 9. Accordingly, the Board is satisfied that the requirements of Article 123(2) EPC are met.

3. Clarity and sufficiency of disclosure

The term "optimum helix angle" has been clarified in claim 1 as being "for minimising turbulent flow and dead spots within flow through the conduit". The claim also makes it clear how this angle is determined. The

skilled person is aware of the techniques by which the two parameters defined in the claim, viz. pressure drop and turbulent kinetic energy, can be measured, and which technique is used is not an essential feature of the invention. It is self-evident that these parameters are to be measured over the part of the conduit for which the optimum helix angle of the formation is to be determined.

The concept of non-dimensionalizing physical measurements is engineering textbook knowledge and well known in the art, particularly in the field of fluid dynamics. There is no reason to believe that a person skilled in the art would have difficulty in understanding what is meant by non-dimensionalizing the pressure drop and the turbulent kinetic energy.

Accordingly, the Board is of the opinion that the objections raised in points 3 and 4 of the Examining Division's communication of 10 September 2007 are no longer applicable and/or not justified. The claims are clear within the meaning of Article 84 EPC, and the present application discloses the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art within the meaning of Article 83 EPC.

4. Technical character

The present invention, as defined in claim 1 of the main request, is clearly of a technical character. As indicated below (see point 6.2), the problem addressed by the present invention is a technical one. The result of the claimed method, namely the identification of the

optimum helix angle, is undoubtedly a technical result. It enables conduits containing such helical formations to be produced in an advantageous manner. It cannot be said that the invention is merely a discovery, scientific theory or mathematical method, because the invention is embodied within a method of determining a particular technical matter. Furthermore, the invention is not a mere presentation of information, since it involves determining a subject of objective technical significance, namely the optimum helix angle of the helical formation for a conduit. To put it another way, the invention is not defined solely by presenting a number which has no technical significance; the invention is defined by the fact that by carrying out the method, the optimum angle for the helical formation in order to minimise turbulent flow and dead spots within flow through the conduit is determined.

Accordingly, the claimed method does not represent a discovery, scientific theory or mathematical method as such, or a presentation of information as such, as defined in Article 52(2)(a) or (d), respectively, in conjunction with Article 52(3) EPC. The respective objections raised in the first instance proceedings are no longer applicable and/or not justified.

5. Novelty

None of the cited documents discloses the features of claim 1 in combination. In particular, all these documents are silent with respect to determining the optimum helix angle of a helical formation for a conduit from plots of curves of the helix angle versus the non-dimensionalized pressure drop and the helix

angle versus the non-dimensionalized turbulent kinetic energy. Accordingly, the subject-matter of claim 1 is new within the meaning of Article 54 EPC.

6. Inventive step

6.1 Document D2 as closest prior art discloses a method according to the preamble of claim 1. It describes conduits with helical formations suitable for imparting helical flow, the spiral flow being desirable because it was found to reduce turbulence and dead spots within the liquid flowing in the conduits (see page 6, 3rd paragraph). Various values of optimum helix angles are disclosed, but it is not indicated how these were determined (possibly by trial and error). A number of potentially relevant parameters affecting the optimum angle, e.g. the dimensions of the tubing or the longitudinal and rotational velocity, density and viscosity of the fluid, are merely mentioned in a general fashion (page 3, third paragraph, and the paragraph bridging pages 9 and 10). However, at no point are the parameters pressure drop and turbulent kinetic energy addressed.

6.2 Determining the optimum angle by trial and error is laborious because it requires the production of a large number of different test conduits, each having a helical formation with a different helix angle, in order to test a good range of different helix angles. The objective technical problem to be solved by the invention is to provide a simplified and quicker method of determining the optimum helix angle.

6.3 The inventive solution resides in the method steps of the characterizing portion of claim 1. The invention is based on the finding that, in order to maintain a given mass flow in a given conduit, with a particular helical flow formation, the pressure drop along the conduit increases as the helix angle increases and the turbulent kinetic energy decreases as the helix angle increases. The pressure drop and turbulent kinetic energy can be measured more easily than the level of turbulent flow and dead spots in a liquid. Moreover, values for these parameters need only be measured with helical formations at a few different helix angles. Once enough data has been assembled at a few different helix angles in order to observe the trends in the variation of pressure drop and turbulent kinetic energy at varying helix angles, the optimum helix angle can be determined straightforwardly from plots of curves of the helix angles versus non-dimensionalized pressure drop and turbulent kinetic energy as defined in the characterizing portion of claim 1. As shown in Figure 2 of the application, the optimum helix angle may be determined from the point of intersection of the two curves, i.e. equality of the two non-dimensionalized parameters, or by taking into account preferred tolerances as described in the last paragraph of page 5 of the description.

6.4 Neither D2 nor any of the other cited documents contains teachings or hints that could render the subject-matter of claim 1 obvious. D1 also merely mentions various optimum helix angle values but is further removed from the invention than D2 in that it is not concerned with reducing turbulence and dead flow regions. D3 and D4 are of no relevance. D5 does not go

beyond D2 and only constitutes prior art under Article 54(3) EPC.

Accordingly, the Board considers that the subject-matter of claim 1 is based on an inventive step within the meaning of Article 56 EPC.

7. Since the current set of application documents fulfils the requirements of the EPC there is no need to hold oral proceedings.

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 that a patent be granted on the basis of the following documents:

Claims:

1 to 6 according to the main request filed with letter dated 27 May 2011;

Description:

pages 1 and 2 filed with letter dated 27 May 2011,
pages 3 to 6 as published;

Drawings:

sheet 1/1 as published.

The Registrar:

The Chairman:

D. Hampe

M. Noël