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D E C I S I O N
of 12 January 1999

Case Number: T 1084/97 - 3.4.2
Application Number: 95200188.1
Publication Number: 0675342
IPC: G01D 5/14, G01D 3/028, G01L 3/10,
G01M 15/00, G01L 23/22

Language of the proceedings: EN

Title of invention:

Magnetostrictive sensor, in particular for measuring torque,
and its application in an engine misfire,-knock or roughness
detection method and apparatus

Applicant:

Sensortech, L. P.

Opponent:

-

Headword:

-

Relevant legal provisions:

EPC Art. 123(2), 84, 54, 56

Keyword:

"Subject-matter extended (no)"
"Clarity (yes)"
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:

-

Catchword:

-



Case Number: T 1084/97 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 12 January 1999

Appellant: Sensortech, L. P.
1948 Highway 1 North
Fairfield
IA 52556 (US)

Representative: Jacquard, Philippe Jean-Luc
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6, Avenue de Messine
75008 Paris (FR)

Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 13 June 1997
refusing European patent application
No. 95 200 188.1 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: E. Turrini
Members: M. Chomentowski
B. J. Schachenmann

Summary of Facts and Submissions

- I. European patent application No. 95 200 188.1 (Publication No. 0 675 342), filed as a divisional application of European patent application No. 92 902 896.7, was refused on the grounds of lack of novelty having regard to any of D1 = EP-A-217 640, D2 = GB-A-849 360 and D3 = DE-A-38 23 935.

Claim 1, which was the only independent claim of the set of 11 claims forming the basis for said decision, read as follows:

"1. A magnetostrictive sensor comprising:
a first winding;
a second winding, and sensor related magnetic flux which passes through both windings and induces sensor related voltages in both windings, such that a first sensor related voltage induced in said first winding and a second sensor related voltage induced in said second winding are additive and do not cancel one another, and said first and second windings being electrically connected and oriented with respect to each other in opposite directions such that an external magnetic field passing through both of said windings induces effectively equal magnitude and opposite polarity, externally related voltages in said windings such that said externally related voltages effectively cancel one another to produce an effectively zero net externally related voltage thereby suppressing stray electromagnetic interference induced voltage in said sensor."

Figure 4 and the dependent claim 7 of said set of claims concerned a sensor with a core which was generally U-shaped.

In said decision, the examining division moreover took the view that inter alia the embodiment of Figure 4 would lack an inventive step having regard to the same prior art documents and the general knowledge of the skilled person.

II. The applicant lodged an appeal against this decision.

With the statement of grounds of appeal were submitted the same text as that having formed the basis for the impugned decision and, as subsidiary request, an amended set of 8 claims whereby claim 1 was distinguished from claim 1 of the main request in that:

"such that **any** external magnetic field passing through both of said windings"

was substituted for

"such that an external magnetic field passing through both of said windings"

and, moreover, the following feature was added as last feature:

"wherein both of said windings are connected in series and wound on the same core through which the same induced flux path passes, wherein said core has first and second spaced legs, and wherein said first winding is wound onto said first leg in a first direction and said second winding is wound onto said second leg in a second direction opposite to said first direction."

III. With a communication dated 1 October 1998, the Board of appeal expressed the opinion that the texts of the claims submitted by the appellant did not appear to be allowable because they seemed to lack clarity, but that a new main claim amended by inserting in the last

feature of the subsidiary request the words "**is generally U-shaped and**" between the expressions "wherein said core" and "has first and second spaced legs", and with inter alia cancellation of Figure 5 and the corresponding text, could be clear and patentable in view of the cited prior art documents.

- IV. With telefax of 27 November 1998, the appellant (applicant) stated that, further to the communication of the Board, it was requested to grant a patent on the basis of suggested allowable claims, together with the cancellation without prejudice of Figure 5; a new set of claims 1 to 7 was filed accordingly.
- V. In support of the patentability of the magnetostrictive sensors of the present application, the appellant (applicant) has pointed out the differences in the constructional structure and/or in the electrical connection of the wirings and, moreover, the additional parts needed in the sensors known from D1, D2 and D3. Therefore, the sensor of the present application was distinguished from said known sensors and it did not result from an obvious consideration thereof, so that, consequently, it was new and it involved an inventive step.

Reasons for the Decision

1. The appeal is admissible.
2. *Admissibility of the amendments*

It is to be noted that the present application is a divisional application, that no objection about the admissibility of the amendments was made during the examination proceedings and that, in the opinion of the Board, this was correct.

Starting from the set of claims having formed the basis for the impugned decision, present claim 1 comprises a combination of claim 1, of dependent claim 4 and of claim 5 dependent from claim 4, all of that version. Moreover, it is specified that the core on which the windings are wound is the core through which the same induced flux path passes and whereby any external magnetic field has been substituted for an external magnetic field, in particular as derivable from the embodiment illustrated by Figure 17 of the original application. Additionally, present claim 1 further specifies that the core, which has first and second spaced legs, is generally U-shaped, this being also based for instance on Figure 17 referred to above, which corresponds to Figure 4 of the version forming the basis for the impugned decision and to Figure 4 of the present version.

It is to be noted that the requested cancellation of Figure 5 of the version forming the basis for the impugned decision is understood as meaning that also the text corresponding to this Figure, i.e. the passage of page 11 located before line 8 of said page and

reading: "Figure 5 shows one specific configuration for monitoring position and stress with a magnetostrictive sensor." has to be deleted. In any case, this cancellation only concerns an embodiment which no more corresponds to present claim 1.

Therefore, the European patent application has not been amended in such a way that it contains subject-matter which extends beyond the content of the application as filed (Article 123(2) EPC).

3. *Clarity of the claims*

Present claim 1 defines the matter for which protection is sought unambiguously and without contradiction with respect to the description and drawings and in particular to the U-shaped core embodiment illustrated by Figure 4, i.e. the only illustrated embodiment.

Therefore, present claim 1 satisfies the requirement of clarity of Article 84 EPC.

4. *Novelty*

4.1 D1 (see Figure 3 and the corresponding text) is concerned with a magnetostrictive sensor comprising:

a first winding (8), a second winding (10), and sensor related magnetic flux which passes through both windings and induces sensor related voltages in both windings, wherein, in particular, both of said windings (8, 10) are wound on the same core (6) through which the same induced flux path passes, wherein said core (6) is generally U-shaped and has first and second spaced legs and each of said windings is wound on one leg of said core.

However, it is derivable from Figure 3 that the windings are not connected in series.

It is to be noted that, in the embodiment illustrated by Figures 7 to 9 of D1, the windings (for instance 411 and 412, or 421 and 422) on the same U-shaped core (31 or 32) are not electrically connected and that the pairs of windings (for instance 411 and 421, or 411 and 431), which are indeed electrically connected, are not on the same U-shaped core (31).

- 4.2 Neither D2 (see claim 1), which shows magnetostrictive sensors which comprise two toroidal exciting windings surrounding torsional bodies and two pick-up coils surrounding coaxially the torsional bodies, nor D3 (see claim 1 and the Figures), which describes magnetostrictive sensors which comprise measurement exciting coils (P1, P2) and measurement sensing coils (M₁, M₂) as well as compensation exciting coils (K₁, K₂) and compensation sensing coils (MK₁, MK₂), are concerned with a U-shaped core structure for the coils.

The further prior art documents are less relevant.

Therefore, the subject-matter of present claim 1 is new in the sense of Article 54 EPC.

5. *Inventive step*

Indeed, each of the documents D1, D2 and D3 addresses the problem arising because of the influence of magnetic external noise. However, as set forth here above, the solution in each case, as well as the construction of each known sensor, is different and not transposable in an obvious way, without hindsight, from one known sensor to the other.

Incidentally, it is also to be noted that, concerning the embodiment illustrated by Figure 4 of the present application, it was objected in the decision under appeal that, since the principle of arranging two sensing coils such that the sensor related signals are added but external signals are cancelled was already well known in the art, using this principle in the context of a specific known type of sensor such as that shown in connection with Figure 4 would not involve an inventive step. In the impugned decision, it is not referred in this respect to any prior art document.

However, since present Figure 4 is mentioned in the present application (see in particular page 10, lines 14 to 16) as being an embodiment of the present invention and since no indication is given in the decision under appeal about said specific known type of sensor "such as" that shown in connection with Figure 4, this argumentation cannot convince.

Therefore, the subject-matter of present claim 1 involves an inventive step in the sense of Article 56 EPC.

6. Consequently, present claim 1 is patentable in the sense of Article 52(1) EPC and a patent can be granted on this basis.

Order

For these reasons it is decided that:

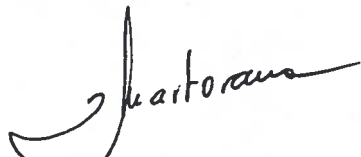
1. The decision under appeal is set aside.
2. The case is remitted to the examining division with the order to grant a patent on the basis of the following patent application documents:

Description: pages 1 to 18, filed with applicant's (appellant's) letter dated 6 February 1997, with deletion of the passage of page 11 located before line 8 of said page and reading: "Figure 5 shows one specific configuration for monitoring position and stress with a magnetostrictive sensor.";

Claims: Nos. 1 to 7, filed with appellant's letter dated 27 November 1998;

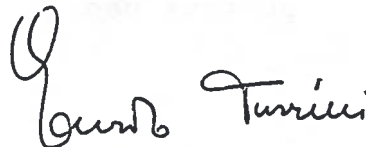
Drawings: Sheets 1/3 and 2/3 (Figure 1, 2, 3A, 3B and 4), filed with applicant's (appellant's) letter dated 6 February 1997.

The Registrar:



P. Martorana

The Chairman:



E. Turrini



R. Sch.