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**Datasheet for the decision
of 25 September 2019**

Case Number: T 0405/14 - 3.4.01

Application Number: 09169121.2

Publication Number: 2163905

IPC: G01P3/487, G01P3/488, G01P21/02

Language of the proceedings: EN

Title of invention:
Self-testing sensor

Applicant:
Smith, William L.

Headword:
Self-testing sensor / William L. Smith

Relevant legal provisions:
RPBA Art. 13(1)
EPC Art. 56
EPC R. 103(1)(a)

Keyword:

Inventive step - (no) - closest prior art

Exclusion of an item of prior art as "closest prior art" in the presence of a more promising starting point (no)

Reimbursement of appeal fee - substantial procedural violation (no)

Decisions cited:

T 2057/12



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Case Number: T 0405/14 - 3.4.01

D E C I S I O N
of Technical Board of Appeal 3.4.01
of 25 September 2019

Appellant: Smith, William L.
(Applicant) 8 Mill Creek Drive
Brevard, NC 28712 (US)

Representative: Johnstone, Douglas Ian
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 18 September
2013 refusing European patent application No.
09169121.2 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman P. Scriven
Members: P. Fontenay
J. Geschwind

Summary of Facts and Submissions

I. This is the decision in the applicant's appeal of the Examining Division's decision to refuse European patent application No. 09 169 121.

II. The decision to refuse the application refers to a previous communication of the Examining Division, dated 27 June 2013. In this communication, the Examining Division held that the subject-matter of the independent claims on file lacked inventive step in the sense of Article 56 EPC.

III. Concretely, the Examining Division considered that the invention would have been obvious for the skilled person adapting the speed sensor known from document

D1: US-A-5 594 173,

in the light of document

D2: US-A-4 831 362.

IV. The appellant requested that the decision of the Examining Division to refuse the application be set aside and that a patent be granted on the basis of his main request, filed with the statement of grounds.

As an alternative, grant of a patent on the basis of a set of claims according to one of auxiliary requests 1 to 4, also filed with the statement of grounds, was

requested.

Arguments supporting the existence of inventive step with regard to the various documents cited by the Examining Division were put forward.

The appellant further alleged that the Examining Division committed a substantial procedural violation in its approach of inventive step. It thus requested reimbursement of the appeal fee.

- V. In a communication under Article 15(1) RPBA, the appellant was informed of the Board's preliminary view.

It was acknowledged that the claims according to the main request and auxiliary requests defined new subject-matter.

In the Board's view, both documents D1 and D2 constituted suitable starting points for assessing inventive step for the main request.

Starting from the teaching of document D1, the existence of an inventive step appeared to hinge on the question of whether the skilled person would have considered integrating the various units of the speed sensor and testing device into a single housing, as defined in claim 1 of the main request. A similar question arose with regard to the various units of the self-testing device known from document D2.

The independent claims of auxiliary requests 1, 2 and 3 contained additional limitations regarding the ability of the induction device to generate a periodic magnetic field so as not significantly to impact the signal

conditioning device and driving circuit (auxiliary request 1) and some additional features in order to achieve this (auxiliary requests 2 and 3).

Independently of the shortcomings in clarity and sufficiency of disclosure affecting the independent claims of said auxiliary requests 1, 2 and 3, the Board observed that said added features would hardly affect the conclusions with regard to the main request.

The additional features regarding the various testing modes, introduced in the independent claims of auxiliary request 4, did not appear to reflect the actual embodiments of the invention and were, therefore, considered to define added subject-matter, contrary to Article 123(2) EPC. It was further observed that document D1 explicitly envisaged various testing modes so that the added features were unlikely to justify the existence of an inventive step.

VI. In reply to the Board's communication, the appellant filed revised sets of claims for auxiliary requests 1 to 4.

A new auxiliary request 5 was also filed. It differed from auxiliary request 4 in that the various operating modes were described in greater detail.

Concerning inventive step, the appellant argued that the skilled person would not consider D2 as closest prior art, since it did not disclose magneto-resistive speed-sensors or sensing elements relying on the Hall effect. This appeared all the more true under the present circumstances, considering that document D1 was available. D1 appeared to be a much more suitable starting point, since it addressed problems regarding

the testing of speed sensors based on Hall effect or magneto resistive sensors, which was exactly the problem addressed by the claimed invention.

- VII. Oral proceedings before the Board took place on 25 September 2019 in presence of the appellant's representative.
- VIII. The appellant confirmed his main request, as filed with the statement of grounds; and auxiliary requests 1 to 5, as filed in reply to the communication of the Board.
- IX. During oral proceedings, a set of claims 1-9 according to a new auxiliary request 6 was filed.
- X. Claim 1 of the main request reads:

*A self-testing speed sensor (10)
comprising:
a sensing element (28) configured to sense
a motion parameter of an object (12), the
sensing element (28) being a Hall-effect
sensing device or a magneto resistive
sensing device:
a signal conditioning device (30) in
communication with an output of the sensing
element, the signal conditioning device
configured to generate a motion signal
related to the sensed motion parameter of
the object;
a magnetic induction device (26) configured
to induce a magnetic field upon the sensing*

element (28) to simulate the motion parameter of the object (12); and a driving circuit (24) configured to supply the magnetic induction device (26) with a periodic signal causing the magnetic induction device to induce a periodic magnetic field upon the sensing element (28);

wherein, when the periodic magnetic field is induced upon the sensing element (28), the signal conditioning device (30) is further configured to generate an operability indication signal indicating the operability of the sensing element; and characterised in that:

the operability indication signal is generated independently of the presence of the object (12), and

the sensing element (28), the signal conditioning device (30), the magnetic induction device (26), and the driving circuit (24) are all contained in a housing (18).

Independent claim 10 of the main request defines a corresponding method of performing a self-test.

- XI. Claim 1 of auxiliary request 1 differs from claim 1 of the main request in that it incorporates ,at the end, the additional limitation: *the magnetic induction device (26) is configured to generate the periodic magnetic field to not significantly impact the signal conditioning device (30) and driving circuit (24).*

Independent claim 10 of auxiliary request 1 incorporates a corresponding amendment.

- XII. Claim 1 of auxiliary request 2 further adds, at the end, the limitation: *wherein the signal conditioning device (30) and driving circuit (24) are positioned within the housing (18) at a distance from the magnetic induction device (26) such that they are not negatively affected by the periodic magnetic field.*

Independent claim 10 of auxiliary request 2 incorporates a similar amendment.

- XIII. Claim 1 of auxiliary request 3 differs from claim 1 of auxiliary request 2 in that it incorporates, at the end, the additional limitation: *and wherein a partition to attenuate the periodic magnetic field to protect the signal conditioning device (30) and driving circuit (24) is positioned within the housing (18) between a first set of components including the magnetic induction device (26) and the sensing element (28) and a second set of components including the signal conditioning device (30) and the driving circuit (24).*

Independent claim 10 of auxiliary request 3 incorporates a similar amendment.

- XIV. Claim 1 of auxiliary request 4 differs from claim 1 of auxiliary request 3 in that it incorporates, at the end, the additional limitation: *the self-testing sensor is configured to operate in three modes, a first mode being a self-test mode occurring before the self-testing sensor is installed near the object, a second*

mode being a self-test mode occurring when the self-testing sensor is installed near the object but when the object is stationary, and a third mode being an object-testing mode to sense the motion parameter of the object.

Independent claim 9 of auxiliary request 4 incorporates a similar amendment.

- XV. Claim 1 of auxiliary request 5 differs from claim 1 of auxiliary request 3 in that it incorporates, at the end, the additional limitation: *the self-testing sensor is configured to operate in three modes, a first mode being a self test mode occurring before the self-testing sensor is installed near the gear wheel, a second mode being a self-test mode occurring when the self-testing sensor is installed near the gear wheel but when the gear wheel is stationary, and a third mode being an object-testing mode to sense the rotation of the gear wheel.*

Independent claim 8 of auxiliary request 5 incorporates a similar amendment.

- XVI. The independent claims of auxiliary request 5 differ thus from the independent claims of auxiliary request 4 in that the various operating modes are defined in more detail, referring explicitly to a gear wheel as the object to be measured.

- XVII. Claim 1 of auxiliary request 6 differs from claim 1 of auxiliary request 5 in that it incorporates, at the end, the additional limitation: *the housing (18)*

comprises a power supply terminal (20) for connecting to an external power supply (14), and for supplying power to the signal conditioning device (30), wherein the signal conditioning device (30) comprises a regulator configured to control power that is supplied from the power supply (14) to the sensing element (28) and filter out any spikes or transients.

Independent claim 8 of auxiliary request 6 incorporates a similar amendment.

Reasons for the Decision

Main request - Novelty

1. Document D1 discloses a test device for vehicles having wheel rotation speed sensors, sensitive to the intensity of magnetic fields. The tests are to be carried out at the production location or in workshops. The test device, which incorporates an induction device (magnet coil), is brought into proximity of the sensors to be tested, such that magnetic field coupling is provided. A control unit drives the magnet coil with an AC voltage, thus simulating wheel rotation. This allows functional testing of components which are sensitive to wheel rotation speed, while the wheel itself is stationary.
2. The speed sensor disclosed in D1 is not a self-testing speed sensor, since it requires the presence of a separate test device to check its ability to carry out speed measurements (cf. column 5, lines 10-17; Figures 5, 6). The presence of the sensing element, the signal

conditioning device, the magnetic induction device and the driving circuit in the same housing is thus also not disclosed in D1.

3. The appellant's view, that the operability indication signal is generated independently of the presence of the object constitutes an additional difference between the claimed subject-matter and the disclosure of D1, is not one the Board can share.

4. The various testing or operating modes referred to in D1 are carried out in the presence of a toothed wheel which is coupled to the wheel rotation (cf. Figure 1, column 3, lines 20-29; column 6, lines 6-13). The intensity of the measured magnetic field is undoubtedly affected by the permeability of this toothed wheel. The Board has, however, no doubt that the sensing means provided in D1 are capable of sensing the periodic magnetic field generated by the induction device even in the absence of the toothed wheel. This results from the use, in the context of D1, of Hall-effect sensors (cf. column 8, lines 4-10). While it is acknowledged that the intensity of the signal generated by said sensor will be affected by the presence or absence of the toothed wheel, it must be recalled that such sensors, unlike inductive coils, generate a signal representative of the magnitude of the magnetic field at the measurement location. In the absence of any further specification in claim 1, any signal obtained from the sensed signal can be considered as constituting the operability indication signal of the invention. There is no requirement for said sensed signal to exceed any particular threshold in order to generate the operability signal. As a matter of fact, the operability signal could even be the sensed signal itself, as suggested by the statement in paragraph

[0033] in the description according to which the determination of whether the sensing element is operable may include providing the output signals to an external device, such as an oscilloscope.

5. Document D2 discloses a self-testing sensor. Although primarily conceived for the detection and capture of ferrous debris in a hydraulic circuit, the various sensors disclosed in D2 can also be used for other applications such as speed measurements of moving objects (cf. column 4, lines 25-29).
6. The speed sensor disclosed in D2 does not include a Hall effect sensing device or a magneto resistive sensing device as recited in claim 1, but rather a sensing coil. Moreover, in D2, the sensing element, the signal conditioning device, and the driving circuit are constituted as separate units.
7. The other documents cited in the course of the examination proceedings are less relevant.
8. The subject-matter of claims 1 and 10 according to the main request is thus new in the sense of Article 54 EPC.

Main request - inventive step

9. In the Board's judgement, both documents D1 and D2 constitute suitable starting points for assessing the inventive merits of the claimed invention.

Starting from document D1

10. As already noted, the claimed speed sensor differs from the speed sensor known from D1 in that it is self-testing and in that the sensing element, the signal conditioning device, the magnetic induction device and the driving circuit are all contained in a housing.
11. By integrating all the required components for the self-test in a single unit, the operator will save assembly time, in particular when coupling the magnetic induction device to the sensing element. He will further benefit from a testing environment without superfluous cables.
12. The objective problem may be considered as simplifying the whole testing procedure, thus allowing tests to be performed with a minimum of connections and both before and after installation of the speed sensor near the object to be sensed (cf. paragraph [0011] in the published application).
13. The Board has no doubt that the skilled person would have considered document D2, since it explicitly refers to the use of the self-testing device disclosed for speed measurement (cf. column 4, lines 25-29).
14. While D2 indeed suggests some integration of the various units in a self-testing device, it limits said integration to the sensing element and the magnetic induction device.
15. The skilled person would have recognised the advantages of integrating the sensing element and the magnetic induction device in a single unit as disclosed in D2. He would have further recognised, from the specific

disclosure in D2, which benefits would have resulted, more generally, from the integration in a single unit of the various measuring and testing components. Starting from D1, the claimed invention results from a mere extrapolation of the basic idea underlying the teaching of D2, consisting of incorporating, in a single housing, various components of the testing system.

16. The subject-matter of claim 1 of the main request is, therefore, not inventive in the sense of Article 56 EPC in view of document D1.

Starting from document D2

17. The appellant held that the skilled person would never start from document D2 when document D1 was available. This view relied on the view that document D1, in addition to sharing many features with the claimed invention, also addressed the same problem, i.e. how to test speed sensors relying on Hall effect or magneto resistive properties.
18. The argument is rejected in its very principle.

The fact that D1 is available does not make an objection which would otherwise have been considered possible when starting from D2 any less pertinent.

More fundamentally, the notion of "closest prior art", as it has been developed by the case law of the boards of appeal, appears to encompass two different meanings, depending on the outcome of the objection raised under Article 56 EPC.

On the one hand, when concluding that a claimed invention is inventive, the notion of "closest prior art" seems to rely on the assumption that there exists a metric defining the distance between items of prior art and the invention, and that an invention which is not obvious from the "closest prior art" would a fortiori not be obvious with regard to all other items of prior art which, by definition, are not so close. Independently of the fact that the jurisprudence does not define any such metric beyond indicating what criteria might be considered relevant to it (common features, similar purpose, ...), there are frequent situations in which the identification of a unique closest or best starting point is not straightforward or even possible.

The second meaning is often formulated in terms of a requirement for the "closest prior art" to deal with the same problem as the invention. This is intended to avoid hindsight leading to a finding that inventive step is lacking. Here, there is no requirement that the "closest prior art" be unique, because the basic rule is that an invention lacks inventive step if it would have been obvious to the skilled person, without hindsight, for any starting point.

Furthermore, the assumptions underlying the concept of "closest prior art" do not accord well with the general principle, derived from the case law, that, in order to be successful, an objection of lack of an inventive step must establish a complete logical chain of considerations which would lead the skilled person to the claimed subject-matter. This basic requirement opens the door to the elaboration of various scenarios under the well-established problem-solution approach, and possibly relying on different items of prior art as

starting points, not even limited to items of prior art dealing with the same or similar problem so long as hindsight is avoided.

19. The question to be answered, when selecting a starting point, is, thus, essentially, whether it allows such a realistic objection of lack of inventive step to be raised. In case T 2057/12, the present Board, in a different composition, elaborated on the risks that could result from a rigid application of the criteria developed by the jurisprudence of the boards of appeal when selecting this starting point. Under certain circumstances, this approach may even affect the objectivity of the analysis to be made (cf. T 2057/12, Point 3.2.2). Experience teaches that a document which shares a common purpose with a claimed invention, as well as a large number of features, in order to solve the same or a similar problem, will not necessarily allow a convincing objection of obviousness to be raised against that invention, whereas said invention may indeed result, without hindsight, in an obvious manner from an apparently less promising item of prior art. In this respect, all items of prior art considered as starting points which allow the elaboration of a realistic attack under Article 56 EPC may be considered to qualify as "closest prior art", although this currently accepted terminology is somewhat misleading. The approach thus excludes any abstract notion of metric. It follows that every objection of lack of inventive step has to be assessed on its own merits and that a document selected as starting point cannot be excluded only because some seemingly more promising item of prior art is available.

20. In the present situation, although document D2 shares fewer features with the claimed invention than D1 does,

it is nevertheless a valid starting point. It is, in particular, stressed that D2 explicitly relates to a self-testing device that can be used for speed measurements (cf. column 4, lines 25-29). It is further stressed that claim 1 does not specify the kind of object of which the speed is to be measured. It thus also encompasses debris sensors of the kind disclosed in D2.

21. The claimed invention differs from this known self-testing device in that it incorporates a Hall sensor or a magneto resistive sensing device and in that the sensing element, the signal conditioning device, the magnetic induction device, and the driving circuit are all contained in a housing.
22. A Hall sensor or magneto resistive sensor allows measurement of the magnetic field per se, whereas the signal provided by the induction coil of D2 is indicative of fluctuations of said magnetic field.
23. The integration in a single housing certainly simplifies the sensor's use. As underlined above with regard to D1, it facilitates assembly and contributes to a testing environment free from superfluous cables.
24. The Board fails to identify any inventive contribution in the replacement of the coil arrangement from D2 by a Hall-sensing device or a magneto-resistive sensing device as sensing element. Said sensing means are considered to be equivalent in the context of the invention. Although adapted to provide a signal representative of the intensity of the magnetic field per se, a Hall-sensing device or a magneto-resistive sensing device are also able to reproduce variations of the measured magnetic field over time as required by

the invention in order to carry out the comparison with the signal generated by the circuit driving the induction magnetic device.

25. In the Board's judgement, the skilled person would have recognised that the main difficulty when assembling or operating the self-testing sensor of D1 results from the presence of the cables. This leads to the immediate finding that it would be advantageous to limit their number. This, again, would lead the skilled person to integrate as many elements of the test device as possible in a single housing, and this is all the more true considering that D2 hints at such integration since it already incorporates the two main components, namely the sensing element and the magnetic induction device in one housing.
26. The subject-matter of claim 1 according to the main request is, therefore, not inventive in the sense of Article 56 EPC in view of document D2.

Auxiliary requests 1 to 5 - Admissibility

27. Auxiliary requests 1 to 5 were filed in reaction to the communication of the Board pursuant to Article 15(1) RPBA. Although the Board was still not satisfied that the requests met the requirements of Article 84 EPC, it admitted these requests into the proceedings (Article 13(1) RPBA). It was noted that some of the clarity issues raised by the Board had been resolved and that the amended auxiliary requests 1 to 4 differed only minimally from the previous auxiliary requests 1 to 4. New auxiliary request 5 differed from auxiliary request 4 filed with the statement of grounds in that the modes referred to had been defined in more detail.

28. All in all, the Board acknowledges that the amended auxiliary requests 1 to 4 and new request 5 addressed some of its concerns under Article 84 EPC and that the remaining issues could possibly have been easily resolved, had the Board reached a different conclusion with regard to what it held to constitute the main obstacle to the grant of a patent, that is, the lack of an inventive step of the claimed subject-matter.

Auxiliary requests 1 to 3 - inventive step

29. The additional feature, in claim 1 of auxiliary request 1, that "the magnetic induction device is configured to generate the periodic magnetic field to not significantly impact the signal conditioning device and driving circuit" does not affect the conclusions reached above as to the obviousness of the subject-matter of claim 1 according to the main request.
30. The very purpose of the claimed device makes it obvious for the skilled person that the simulating step should not affect the measurements carried out. It follows that the signal conditioning device and driving circuit must be influenced by the sensed signal only, and not directly by the magnetic field generated by the induction device. The skilled person is aware that the integration to be carried out according to both analyses developed above should guarantee that this requirement is met, in order for the self-testing mode to perform satisfactorily.
31. In order to exclude any interference between the induction device, the signal conditioning device and

the driving circuit to take place, the skilled person would take all measures required for that purpose.

32. If the signal conditioning device and driving circuit were positioned within the housing at such a distance from the magnetic induction device that they would be directly affected by the periodic magnetic field it generates, no information as to the speed sensor could then be obtained. The self-testing device would simply not work. Consequently, the skilled person has no other alternative than to ensure that the magnetic induction device does not directly affect the behaviour of both the driving circuit and the signal conditioning device.
33. As a consequence, no inventive step is seen in the additional feature introduced in claim 1 according to auxiliary request 2.
34. The provision of a partition, positioned within the housing between a first set of components including the magnetic induction device and the sensing element and a second set of components including the signal conditioning device (30) and the driving circuit, as recited in claim 1 of auxiliary request 3, constitutes one of the straightforward measures, of which the skilled person was aware, for shielding the signal conditioning device and driving circuit from the magnetic field generated by the magnetic induction device.
35. The additional limitations introduced into claim 1 of auxiliary requests 1, 2 and 3, therefore, do not affect the conclusion of the Board with regard to claim 1 of the main request. The subject-matter of claim 1 according to auxiliary requests 1, 2 and 3 is not inventive in the sense of Article 56 EPC.

Auxiliary request 4 - Inventive step

36. Independent claims 1 and 9 of auxiliary request 4 differ from claims 1 and 10, respectively, of auxiliary request 3 in that they include the further limitation defined in claim 9 of the main request, as to the self-testing device being configured to perform the self-test in three different modes.
37. The claim's wording does not specify whether the two test-modes refer to two different functionalities of the self-test device or whether they refer to two different testing conditions. Paragraphs [0027] to [0029] of the published application are also ambiguous in this respect, since they merely specify that the self-testing sensor may operate in two self-test modes and a normal sensing procedure. Nothing in paragraphs [0028] and [0029], which describe the first and second test modes, respectively, suggests that the configuration of the self-test device is to be modified accordingly. As a consequence, no structural or functional limitation regarding the claimed device results from the reference in the claim to these two self-test modes.
38. As underlined above with regard to the main request, the Hall effect sensing device of D1 is capable of sensing the magnetic field generated by the magnetic inductor whether a wheel is present or not. Since the sensor of D1 is also primarily intended to operate as a speed sensor, i.e. according to its normal sensing mode, the additional feature is also known from D1. Its introduction in claims 1 and 9 of auxiliary request 4 does not affect the finding reached above with regard to auxiliary request 3.

39. The subject-matter of claim 1 according to auxiliary request 4 is thus not inventive in the sense of Article 56 EPC.

Auxiliary request 5 - Inventive step

40. Claims 1 and 9 of auxiliary request 5 differ from the corresponding claims of auxiliary request 5 in that the three modes are specified and in that the object to be measured is specified to be a gear wheel.
41. Since the speed sensor of D1 is explicitly designed to measure the rotation of a gear wheel, the amendments in claim 1 do not affect the analysis relied above with regard to auxiliary request 4.
42. The subject-matter of claim 1 according to auxiliary request 5 is thus not inventive in the sense of Article 56 EPC

Auxiliary request 6 - Admissibility

43. Article 13(1) RPBA provides that "Any amendment to a party's case after it has filed its grounds of appeal or reply may be admitted and considered at the Board's discretion. The discretion shall be exercised in view of inter alia the complexity of the new subject matter submitted, the current state of the proceedings and the need for procedural economy".
44. Auxiliary request 6 was introduced during the oral proceedings before the Board, i.e. at a particularly late stage of the appeal proceedings. Moreover, the Board observes that the operation consisting in

filtering signals to get rid of interference before further processing is a normal signal-processing measure.

45. Since it appears doubtful whether the added feature would be sufficient to justify an inventive step, the Board considers that the admissibility of Auxiliary request 6 at this particularly late stage of the appeal proceedings would be contrary to the principle of procedural economy. The Board thus decides not to admit auxiliary request 6 into the appeal proceedings.

Substantial procedural violation - Refund of the appeal fee

46. The appellant alleged, in section 7.2 of the statement of grounds, that the Examining Division committed a substantial procedural violation in its approach of inventive step. Concretely, the appellant objected to the combined features of two different documents being taken as a starting point for an objection of lack of inventive step.
47. The Board is not persuaded by the appellant's arguments. The objections raised by the appellant do not relate to procedural aspects of the examination procedure but to the substance of the argumentation relied upon by the Examining Division.
48. In the absence of a procedural violation, let alone of a substantial procedural violation, the Board fails to identify any reason that would justify the refund of the appeal fee (Rule 103(1) (a) RPBA).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



D. Hampe

P. Scriven

Decision electronically authenticated