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D E C I S I O N
of 6 August 2003

Case Number: T 0216/01 - 3.5.2

Application Number: 95119136.0

Publication Number: 0716436

IPC: H01F 38/12

Language of the proceedings: EN

Title of invention:

Ignition coil for an internal combustion engine

Patentee:

DENSO CORPORATION

Opponent:

JOHNSON CONTROLS AUTOMOTIVE ELECTRONICS
BREMI Auto-Elektrik Ernst Bremicker GmbH

Headword:

-

Relevant legal provisions:

EPC Art. 84, 123(2)

Keyword:

"Amendments - added subject-matter (main request - yes)"
"Claims - clarity (auxiliary request - no)"

Decisions cited:

-

Catchword:

-



Case Number: T 0216/01 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 6 August 2003

Appellant: Johnson Controls Automotive Electronics
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Decision under appeal: Interlocutory decision of the Opposition
Division of the European Patent Office posted
15 December 2000 concerning maintenance of
European patent No. 0716436 in amended form.

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: M. Ruggiu
P. Mühlens

Summary of Facts and Submissions

I. The opponents 01 and 02 filed appeals against the interlocutory decision of the opposition division which found that, account being taken of the amendments made by the patent proprietor during the opposition proceedings, the patent and the invention to which it related met the requirements of the Convention.

II. Of the documents of the state of the art cited in the appeal, the following are relevant to this decision:

D1: EP-A-0 431 322; and

D10: FR-A3-2 624 559.

Document D1 was considered as disclosing the closest prior art in the decision of the opposition division. Document D10 was mentioned for the first time by the appellant opponent 01 during oral proceedings held before the board on 6 August 2003.

III. The summons to attend oral proceedings was accompanied by a communication of the board which, *inter alia*, instructed the parties that "...neither the board, nor any of the parties should be taken by surprise at the oral proceedings" and that "should a party wish to make written submissions in preparation for the oral proceedings, it should file them at the EPO at the latest one month before the date scheduled for the oral proceedings". In response to the summons, the respondent proprietor filed an amended claim 1 with a letter dated 4 July 2003 and received on 7 July 2003 at the EPO. The respondent filed a further set of 10

claims during the oral proceedings, as a basis for an auxiliary request. The respondent also indicated at the oral proceedings that he was in a position to deal with document D10 at the oral proceedings.

IV. The appellants (opponents) requested that the decision under appeal be set aside and that the European patent be revoked.

The respondent (patentee) requested that the patent be maintained in amended form on the basis of (main request)

- claim 1 filed with letter of 4 July 2003,
- claims 2 to 10, description and drawings in the form approved by the opposition division;

or (auxiliary request)

on the basis of claims 1 to 10 filed in the oral proceedings, description and drawings in the form approved by the opposition division.

V. Claim 1 in the version of the main request reads as follows:

"An internal combustion engine ignition coil disposed into a plug hole of an internal combustion engine for supplying high voltages to an ignition plug thereof, comprising:

a case (100),

an iron core (502), which is housed in said case (100),
a coil housed inside said case (100) and disposed at an
outer periphery of said iron core (502) and which
includes a primary coil (516) and a secondary coil
(512), wherein

said iron core (502) is formed by stacking in a
diameter direction of said iron core (502) a plurality
of magnetic steel sheets which have different widths
with a cross-section in the diameter direction of said
iron core (502) being substantially circular,

characterized by

an auxiliary core (508) which is housed in said case
(100) and is provided outside said primary coil (516)
and said secondary coil (512) thereby to form a semi-
closed magnetic path, and

in that said iron core (502)

being formed by said stacked magnetic steel sheets
which define a circle (500) circumscribing the edges of
said magnetic steel sheets, said circle (500) having a
diameter of no more than approximately 15 mm,

being formed by said stacked magnetic steel sheets
where each individual sheet has a thickness of no
greater than 0.5 mm and not more than 8% of said
diameter of said circle circumscribing the edges of
said sheets,

being formed by said stacked magnetic steel sheets of no less than six kinds of widths,

being formed by said stacked magnetic steel sheets which number at least 12 sheets, and

being formed so that said stacked magnetic field sheets cover no less than 90% of said area of said circle (500) circumscribing the edges of said sheets."

Claims 2 to 10 of the main request are dependent on claim 1.

- VI. Claim 1 in the version of the auxiliary request differs from claim 1 according to the main request only in that the words "and wherein said iron core (502) has magnets (504, 506) disposed at both of its ends," are added at the end of the preamble of the claim, just before the words "characterised by".

Claims 2 to 10 of the auxiliary request are dependent on claim 1.

- VII. The arguments of the appellant opponents which are relevant to the present decision can be summarised as follows:

Claim 1 of both the main and the auxiliary request mentioned an auxiliary core. This feature did not appear in any of the claims previously examined during the examination and opposition proceedings and necessitated an additional search. Thus, the claims of the main and auxiliary requests should not be admitted into the proceedings.

Document D1 described an ignition coil that had all the features of the pre-characterising portion of claim 1, main or auxiliary request, and further comprised an auxiliary core and permanent magnets disposed between the ends of a central iron core and the auxiliary core. The magnetic circuit of the ignition coil described in D1 could be regarded as being closed from a mechanical point of view. However, since the permeability of a permanent magnet (close to the permeability of air) was much lower than the permeability of soft iron, the magnetic circuit described in D1, which included permanent magnets, was in fact "open" from a magnetic point of view and could be regarded as being "semi-closed". The term "semi-closed" was not clear in itself and the patent did not indicate how closed or open a magnetic circuit should be to fall within the meaning of the term, so that the scope of protection was unclear. In particular, "semi-closed" could refer to the axial slit 508a in the auxiliary core, or indicate that there were further gaps in the magnetic circuit. Further, the patent in suit disclosed a semi-closed magnetic path only in combination with magnets 504, 506. These magnets were not mentioned in claim 1 of the main request, so that the subject-matter of this claim extended beyond what had been originally disclosed. It was also known that the magnetic circuit of an ignition coil had to comprise some gap and document D10, which had been found in a search necessitated by the filing of the proprietor's present main request, described an ignition coil disposed in the plug hole of an internal combustion engine and having a central iron core separated by a gap from an auxiliary core provided outside the primary and secondary coils, thereby

forming an open magnetic circuit. Thus, an open magnetic circuit, if this was the meaning to be given to the term "semi-closed magnetic path", was obvious to the skilled person.

VIII. The arguments of the respondent proprietor which are relevant to the present decision are essentially as follows:

The term "semi-closed" had to be understood in the light of the first two lines of the description of the patent in suit, according to which the invention related to an ignition coil "having an open magnetic path structure". Thus, the term "semi-closed" indicated that the magnetic circuit was open. Permanent magnets were made of magnetic material and thus did not "open" the magnetic circuit. Thus, as appeared in particular also from page 5, lines 45 to 49, of the patent in suit, "semi-closed" meant that, in addition to the permanent magnets, the magnetic circuit included a further gap, i.e. a further section having a permeability close to that of air. This terminology was consistent with that used in document D1 which related to an ignition coil having permanent magnets inserted in the magnetic circuit and which described this magnetic circuit as being closed. Document D10 related to an ignition coil with an open magnetic path but devoid of permanent magnets and thus was not relevant to the invention of the patent in suit. Furthermore, it was known that gaps in a magnetic circuit, for example between the rotor and stator of an electric motor, had to be kept as small as possible. Thus, in view of the state of the art, it was not obvious to provide a further gap in a magnetic circuit including permanent magnets.

Reasons for the Decision

1. The appeals are admissible.
2. *Procedural matters*
 - 2.1 Claim 1 of the main request, which has been filed with the letter dated 4 July 2003, differs from claim 1 as approved by the opposition division *inter alia* in that it further specifies an auxiliary core housed in the case of the ignition coil and provided outside the primary coil and the secondary coil thereby to form a semi-closed magnetic path. This feature was not recited in any of the claims filed previously.
 - 2.2 Claim 1 according to the main request was received at the EPO on 7 July 2003 (a Monday) and thus within the term set out in the communication of the board annexed to the summons to oral proceedings. In the judgment of the board, the parties could reasonably be expected to be able to discuss the clarity of the feature identified in section 2.1 above in the oral proceedings. The prior art documents to be considered in relation to this feature were D1, which was already identified as the closest prior art, and D10, which was filed at the oral proceedings. The need to file document D10 arose only after the main request had been filed. D10 is only six pages long and does not raise particularly complex issues, so that it was reasonable to expect the respondent to deal with D10 at the oral proceedings (after being given time to study it during the lunch

break). The representative of the respondent confirmed that he was indeed able to do so.

- 2.3 In view of the above factors, claim 1 filed with the letter of 4 July 2003 and D10 were admitted into the proceedings and it was not considered necessary to adjourn the oral proceedings to a later date.
- 2.4 Claim 1 of the auxiliary request filed at the oral proceedings differs from claim 1 of the main request only in that it further specifies that the "iron core (502) has magnets (504, 506) disposed at both its ends". This further feature (taken from claim 7 of the main request) has been added in response to objections raised by the appellants that the subject-matter of claim 1 of the main request extends beyond the content of the application as filed. The introduction of this feature into claim 1 does not raise particularly complex issues since prior art relevant to this feature can be found in document D1, i.e. in the closest prior art. It was therefore reasonable to expect the appellants to deal with it at the oral proceedings.

Thus, the auxiliary request was admitted into the proceedings at the oral proceedings.

3. *Main request*

- 3.1 Claim 1 of the proprietor's main request includes the feature that an auxiliary core is housed in the case of the ignition coil and is provided outside the primary coil and the secondary coil thereby to form a semi-closed magnetic path.

3.2 The term "semi-closed" occurs only once in the whole description of the patent in suit, in the paragraph at page 5, lines 44 to 49, of the B-publication which reads as follows:

"These magnets 504, 506, for example, consist of samarium-cobalt magnets but, as shown in FIG. 2, by setting the thickness T of the magnets 504, 506 to above 2.5 mm, for example, neodymium magnets can also be used. This is because the construction of a so-called semi-closed magnetic path by means of an auxiliary core 508 fitted on the outer side of the primary spool 514 (further discussed later) reduces the diamagnetic field acting on the magnets 504, 506 to 2 to 3 kOe (kilo-oersteds), which is less than that of a closed magnetic path. By using neodymium magnets for the magnets 504, 506, an ignition coil 2 usable even at a temperature of 150 °C can be constructed at a low cost."

The term "semi-closed" also occurs only once in the application as filed on which the patent in suit is based, in a passage identical to the one reproduced above.

3.3 As is apparent from the passage reproduced above, the patent in suit and the corresponding application as filed teach the construction of a so-called semi-closed magnetic path only in connection with the provisions of magnets 504, 506.

Specifying a semi-closed magnetic path without requiring the presence of magnets, as in claim 1 according to the main request, therefore introduces

subject-matter that extends beyond the content of the application as filed.

3.4 Thus, the board has come to the conclusion that claim 1 of the main request contravenes Article 123(2) EPC.

4. *Auxiliary request*

4.1 To determine whether the term "semi-closed magnetic path", which is included in claim 1 of the auxiliary request, can be considered as clear or not, the board has tried to understand it in the context of the patent, as read by a skilled person.

The passage of the patent in suit reproduced above in section 3.2, which contains the only occurrence in the description of the term "semi-closed", discusses the results to be achieved with a so-called semi-closed magnetic path. However, this passage does not provide a particular description of a semi-closed magnetic path, but merely indicates that it is not a closed magnetic path. Furthermore, the first two lines of the description of the patent in suit indicate that "the present invention relates to an ignition coil for an internal combustion engine having an open magnetic path structure". In the judgment of the board, it follows from these passages of the patent in suit that the term "semi-closed magnetic path" is to be understood as indicating some unspecified form of open magnetic path. Neither the patent in suit nor the documents cited in the appeal provide further indications that could be used to define the meaning of "semi-closed magnetic path" more precisely.

4.2 Further, the board has considered whether the claim is clear enough for a meaningful assessment of inventive step to be possible.

It is undisputed that document D1 describes, with reference to Figure 6 thereof, an ignition coil having all the features recited in the pre-characterising portion of claim 1 of auxiliary request and further comprising an auxiliary core 5. According to D1, the permanent magnets 6, 8 are disposed in air gaps between the central iron core 4 and the auxiliary core 5, the auxiliary core 5 forming a closed magnetic path in conjunction with the central iron core 4.

To assess inventive step, it would be necessary to determine whether it would be obvious to the skilled person to replace the closed magnetic path, which is provided in the closest prior art described in D1, by a "semi-closed magnetic path". In this case, this would require that the inventiveness or obviousness of introducing a "semi-closed magnetic path" be assessed taking into account document D10, which discloses an ignition coil having a central iron core and an auxiliary core forming an open magnetic path. In the judgment of the board, the assessment of inventive step could not be meaningful in the present situation without knowing which particular form of open magnetic path is intended to be defined by the term "semi-closed magnetic path". Since, as discussed above, no information is available about this, the board considers that the term "semi-closed" does not specify the magnetic path clearly enough to allow a meaningful assessment of inventive step. In the view of the board,

this indicates that the term in question renders claim 1 unclear.

4.3 Thus, the board has come to the conclusion that claim 1 of the auxiliary request is not clear in the sense of Article 84 EPC.

5. Since neither version of claim 1 meets the requirements of the EPC, the patent has to be revoked.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The patent is revoked.

The Registrar:

The Chairman:

D. Sauter

W. J. L. Wheeler