Datasheet for the decision of 2 April 2014

Case Number: T 1767/09 - 3.5.02
Application Number: 01308335.7
Publication Number: 1193817
IPC: H01T13/38
Language of the proceedings: EN

Title of invention: Spark plug

Patent Proprietor: NGK Spark Plug Co., Ltd

Opponent: Federal-Mogul Ignition GmbH

Relevant legal provisions:
EPC Art. 104
EPC 1973 Art. 54, 56

Keyword:
Novelty - main request (no)
Inventive step - first auxiliary request (no) - second auxiliary request (yes)
Apportionment of costs - (no)
Case Number: T 1767/09 – 3.5.02

DECISION
of Technical Board of Appeal 3.5.02
of 2 April 2014

Appellant: Federal-Mogul Ignition GmbH
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Decision under appeal: Decision of the Opposition Division of the European Patent Office posted on 26 June 2009 rejecting the opposition filed against European patent No. 1193817 pursuant to Article 101(2) EPC.

Composition of the Board:
Chairman: M. Ruggiu
Members: R. Lord
P. Mühlens
M. Léouffre
W. Ungler
Summary of Facts and Submissions

I. This is an appeal of the opponent against the decision of the opposition division to reject the opposition against the European patent No. 1 193 817. The reasons given for the decision were that the subject-matter of the independent claims of the granted patent was new and involved an inventive step with respect to the cited documentary prior art and that the alleged prior use was not proven. In that decision the opposition division also awarded costs against the opponent with respect to the first of the two oral proceedings held before them.

II. The following document cited in the patent and referred to by the opponent is relevant for this decision:


III. Oral proceedings before the board took place on 2 April 2014.

The appellant (opponent) requested that the decision under appeal be set aside and that the patent be revoked. Furthermore, the appellant requested that the apportionment of costs decided by the opposition division be set aside.

The respondent (patent proprietor) requested that the appeal be dismissed (main request) or, if this was not possible, that the decision under appeal be set aside and the patent be maintained in amended form on the basis of the claims of one of the four auxiliary requests filed with letter dated 12 March 2010. Furthermore, the respondent requested to confirm the decision of the opposition division as regards
apportionment of costs or, if this was not possible, to award to them the costs incurred by the proprietor associated with the preparation and attendance at the second oral proceedings before the opposition division.

IV. Claim 1 of the patent in suit (respondent's main request) reads as follows:

"A spark plug (100) comprising: a center electrode (3); a metal shell (1), and an insulator (2) comprising an alumina ceramic and disposed between the center electrode 3 and the metal shell (1),

wherein, at least part of the surface of the insulator (2) is covered with a glaze layer (2d),

the glaze layer (2d) contains a lead component content of 1 mol% or lower in terms of PbO,

the glaze layer (2d) comprises: 35 to 80 mol% of a first ingredient comprising 5 to 60 mol% of silicon component in terms of SiO₂ and 3 to 50 mol% of boron component in terms of B₂O₃; and 12 to 60 mol% of a second ingredient comprising at least one of a zinc component and an alkaline earth metal component R, in which R is at least one selected from the group consisting of calcium, strontium, and barium, in terms of ZnO and empirical formula RO, respectively,

the total content of the first ingredient and the second ingredient is from 65 to 98 mol%,

the total content of the zinc component in terms of ZnO and at least one of the barium component in terms of BaO and strontium component in terms of SrO is from 12 to 30 mol%,

the glaze layer (2d) further contains at least one alkali metal component selected from the group consisting of sodium, potassium and lithium in a total amount of from 2 to 15 mol% in terms of Na₂O, K₂O and Li₂O, respectively,
the insulator (2) includes, in an axially central position thereof, a projection part protruding from the outer circumferential surface thereof and extending in a circumferential direction,

the insulator (2) includes a main body located adjacent to the projection part on the rear side thereof, which is the side opposite to the front side facing the center electrode in the axial direction, and the main body of the insulator includes a base portion having a cylindrical outer circumference, and

the outer circumference of the base portion is covered with the glaze layer (2d) which, when examined by the method as in JIS B 0601, gives a surface roughness curve having a maximum height Ry of 10μm or smaller,

wherein the insulator (2), when examined by the method as in JIS B 0601, gives a surface roughness curve having a maximum height Ry of 15 to 35μm, and the glaze layer (2d) has thickness of from 10 to 50μm."

Claim 1 according to the respondent's first auxiliary request differs from that of the main request in that, in the definition of surface roughness of the glaze layer, the range "10μm or smaller" is replaced by "1μm to 4μm".

Claim 1 according to the respondent's second auxiliary request reads as follows:

"A spark plug (100) comprising: a center electrode (3); a metal shell (1); and an insulator (2) comprising an alumina ceramic and disposed between the center electrode (3) and the metal shell (1),

wherein at least part of the surface of the insulator (2) is covered with a glaze layer (2d),
the glaze layer (2d) contains a lead component content of 1 mol% or lower in terms of PbO,
the glaze layer (2d) comprises: 35 to 80 mol% of a first ingredient comprising 5 to 60 mol% of silicon component in terms of SiO₂ and 3 to 50 mol% of boron component in terms of B₂O₃; and 10 to 60 mol% of a second ingredient comprising at least one of a zinc component and an alkaline earth metal component R, in which R is at least one selected from the group consisting of calcium, strontium and barium, in terms of ZnO and empirical formula RO, respectively,
the total content of the first ingredient and the second ingredient is from 65 to 98 mol%,
the total content of the zinc component in terms of ZnO and at least one of the barium component in terms of BaO and strontium component in terms of SrO is from 10 to 30 mol%,
the glaze layer (2d) further contains at least one of bismuth and antimony as a fluidity-improving ingredient in a total amount of from 0.5 to 5 mol% in terms of Bi₂O₃ and Sb₂O₃, respectively,
the glaze layer (2d) furthermore contains at least one alkali metal component selected from the group consisting of sodium, potassium, and lithium in a total amount of from 2 to 15 mol% in terms of Na₂O, K₂O, and Li₂O, respectively,
the insulator (2) includes, in an axially central position thereof, a projection part protruding from the outer circumferential surface thereof and extending in a circumferential direction,
the insulator (2) includes a main body located adjacent to the projection part on the rear side thereof, which is the side opposite to the front side facing the center electrode (3) in the axial direction, and the main body of the insulator (2) includes a base portion having a cylindrical outer circumference, and
the outer circumference of the base portion is covered with the glaze layer (2d) which, when examined by the method as in JIS B 0601, gives a surface roughness curve having a maximum height $R_y$ of 1$\mu$m to 4$\mu$m,

wherein the insulator (2), when examined by the method as in JIS B 0601, gives a surface roughness curve having a maximum height $R_y$ of 15 to 35$\mu$m, and the glaze layer (2d) has thickness of from 10 to 50$\mu$m."

The letter of 12 March 2010 further included dependent claims 2 to 5 and replacement description pages 2 to 7, 15 to 18 and 21 to 24 of the second auxiliary request.

V. The arguments of the appellant which are relevant for the present decision can be summarised as follows:

The document D1 described in paragraphs [0097] to [0101] a method of fabricating a spark plug which was in substance identical to that described in the patent in suit in paragraphs [0087] to [0091]. The ranges for the composition of the glaze layer defined in claim 1 of that document also overlapped almost completely with those of the independent claim 1 of the patent in suit. It therefore had to be assumed that the product of that known method would also have the surface roughness characteristics defined in claim 1 of the patent in suit, so that the subject-matter of that claim was not new.

Tumbling did not form part of the method of the invention as claimed, because it was described in the patent in suit only in the context of counter-examples not falling within the scope of the claims. The grinding step described in the patent in suit as well as in D1 was not relevant to the surface roughness,
because it was a process for shaping the spark plug, in particular to form the corrugations.

Moreover, the grinding step described in the patent in suit was not responsible for the defined surface roughness of the insulator, because that roughness was determined only by the composition of the insulator. The grinding step could not reduce the surface roughness because at that stage the hard ceramic particles were not strongly bound together, so that grinding could only lead to removal of entire particles. The profile depicted in Fig. 5 of the patent in suit was consistent with this assumption, taking into account the likely statistical distribution of particle sizes. Use of a coarser tool which would increase roughness in the method of D1 could be excluded, because such a process would not be described as grinding, but rather as milling.

The subject-matter of claim 1 of the first auxiliary request did not involve an inventive step because D1 described in paragraph [0003] that a smooth glaze layer was desirable. Since the claim defined only improved smoothness, without defining how it was achieved, this could not result in the presence of an inventive step, particularly since the patent did not suggest that any special measures were necessary to achieve this improvement.

The subject-matter of claim 1 of the second auxiliary request was obvious because D1 suggested incorporating a bismuth component. In particular paragraph [0021] stated that this component had the effect of reducing the softening point of the glaze, which the skilled person would have recognised as being beneficial
because this would have the effect of increasing fluidity at higher temperatures.

The claimed subject-matter was also anticipated or rendered obvious by the prior use discussed during the procedure before the opposition division.

The award of costs in the decision under appeal was not justified, because the late filing of the request to hear witnesses was a consequence of the change to the patent proprietor's requests in the letter dated 9 July 2007.

VI. The respondent argued essentially as follows:

The method of the patent in suit was different from that of D1 because the skilled person carrying out the method of the patent would have implemented it taking into account the required surface roughness. This point applied in particular to the grinding step, in which the selection of the grinding tool would influence the resultant roughness of the insulator, and hence also that of the glaze layer. The result of this selection was demonstrated by Fig. 5 of the patent in suit. The skilled person carrying out the method of D1 could for instance have chosen to use a much coarser tool in order to increase the grinding speed. The existence of such options which would not result in the surface roughness as claimed meant that, in accordance with the case law of the boards of appeal, the surface roughness as claimed could not be considered as an implicit feature of D1.

The subject-matter of claim 1 of the first auxiliary request involved an inventive step, because it addressed the technical problem of suppressing
flashover in a manner which was not suggested by D1, and because the skilled person wishing to solve that problem in the spark plug of D1 was presented with various other options, such as modifications to the rubber or elastomeric cap to be fitted to the plug. In that context it was relevant that D1 contained no disclosure of that cap.

The incorporation of bismuth or antimony into the glaze layer in order to improve its fluidity, as defined in claim 1 of the second auxiliary request, was not obvious from D1 because that document disclosed only the incorporation of titanium and zirconium for that purpose. The disclosure in D1 that bismuth was effective to lower the softening point of the glaze did not render this development obvious, because lowering the softening point might result in it falling below the optimum range disclosed in paragraph [0059] of that document, and because it did not necessarily follow that a lowering of the softening point would result in increased fluidity at the significantly higher firing temperature.

The alleged prior use was not relevant to the second auxiliary request because the glazes disclosed in that respect contained neither bismuth nor antimony.

The award of costs in the decision under appeal was justified because the patent proprietor was entitled to revert to the claims as granted at the stage in the procedure when he did this, so that the opponent should have been prepared for such a change of request, and because the opponent had had nearly two months between learning of that change and the oral proceedings at which he requested the hearing of witnesses.
Reasons for the Decision

1. The appeal is admissible. In this context the board notes that the respondent, in his letter dated 12 March 2010 in reply to the statement of grounds of appeal, argued that the notice of appeal did not comply with Rule 99(1)(a) EPC because it did not specify the address of the appellant. However, since in the meantime the appellant has filed requests relating to a change of name of the appellant (letter dated 25 February 2013) and to a transfer of status as opponent (letter dated 18 June 2013), both of which contain indications of the relevant address, the board concludes that this deficiency has been corrected.

2. Main request – Novelty (Article 54 EPC 1973)

2.1 It is not disputed that the document D1 describes explicitly a spark plug comprising all of the technical features of claim 1 of the patent in suit as granted, with the exception of the two features relating to surface roughness of the glaze layer and of the insulator. In particular the board notes that in the notice of opposition (fax received at the EPO on 17 August 2005) the appellant (then opponent) provided a table illustrating the substantial overlap between the amounts of the different components of the glaze in the independent claims of the patent in suit (expressed in mol%) and of D1 (expressed in weight%).

2.2 Thus, from the point of view of novelty of the subject-matter of claim 1 of the respondent's main request with respect to D1, the issue to be resolved is that of
whether, as argued by the appellant, the similarity between the fabrication methods of the patent and D1 are such that the products of the method of D1 would inherently have surface roughness values falling within the ranges defined in claim 1 of the patent in suit.

2.2.1 The detailed disclosure of the fabrication method for the spark plug of the patent in suit appears in paragraphs [0087] to [0091]. The corresponding disclosure in document D1 appears in paragraphs [0097] to [0101]. The only substantive difference between these passages is in the passage of the patent in suit relating to tumbling (last sentence of paragraph [0089]). In the decision under appeal the division argued that the step of tumbling formed part of the fabrication method of the patent in suit, and could thus be assumed to be responsible for the reduced roughness of the insulator and of the glaze, so that the claimed subject-matter was new over D1. The board does not find this argument convincing, because it is apparent from the patent in suit that the tumbling step is included only in Example 3, as indicated in Table 6 on page 20. This example is however not an embodiment of the claimed invention, because the glaze layer thickness indicated in that table (5µm) is not in the range defined in claim 1 (10 to 50µm). The board considers it to be clear from paragraphs [0022] and [0096] of the patent in suit that this example, together with Example 4 in the same table, serves to demonstrate that if the glaze layer thickness is less than that defined in the claims, then further measures, such as tumbling, are required in order to achieve the desired level of surface roughness, in contrast to the examples falling within the terms of the claims, for which such further measures are not necessary. The board therefore concludes that the step of tumbling
does not form part of the method of fabricating the
spark plugs according to the claims of the patent in
suit, so that the conclusion in the decision under
appeal in this respect was not correct.

2.2.2 The respondent has argued that since the patent in suit
discloses the desired level of surface roughness of the
insulator and the glaze layer, it was implicit that the
skilled person carrying out the described method would
implement it with that aim in mind, so that it was not
correct to assume that the method described in the
patent in suit was the same as that of D1. In this
respect the respondent referred in particular to the
step of grinding the insulator in paragraph [0088] of
the patent in suit and paragraph [0098] of D1, arguing
that the skilled person carrying out the method of the
patent in suit would have selected a grinding tool
bearing in mind the required level of roughness. In
contrast, when carrying out the method of D1 he might
have chosen a much coarser grinding tool, for instance
in order to achieve a higher speed of grinding, thus
resulting in a level of surface roughness higher than
that defined in the claims of the patent in suit.

2.2.3 The board does not find this line of argument to be
convincing, because the step of grinding of the
insulator, which is carried out between the step of
compaction and the step of firing, is not a surface
treatment process, but is instead one of shaping the
insulator (forming for instance the corrugations). This
is in particular apparent from the wording in paragraph
[0088] of the patent in suit ("processed with a grinder
into a given insulator shape") and the corresponding
wording in paragraph [0098] of D1. Moreover, at the
stage at which the grinding is carried out, the
insulator consists of compacted ceramic particles,
which are themselves extremely hard, but which are not firmly bound together (because the compact has not yet been fired), so that the grinding process would only be able to remove entire particles, as a result of which the surface roughness would be determined by the composition of the insulator, not by the grinding process. The board therefore concludes that, since the ceramic compositions used in the patent in suit and in D1 are essentially the same, the resultant surface roughness of the insulator of D1 would be the same as that of the patent in suit, and that since the compositions and deposition methods for the glaze layers are also essentially the same, the surface roughness of that layer resulting from the method of D1 would also be the same as that of the patent in suit.

2.2.4 In this respect the board is not convinced by the respondent's argument that the skilled person carrying out the method of D1 might have chosen a grinding tool sufficiently coarse to result in a worsening of the surface roughness, because a process of removing material with such a coarse tool would not fall within the normal meaning of the term "grinding", so that if such a process had been intended, then an expression such as "milling" would have been used. Moreover, the board cannot follow the respondent's argument that the surface roughness curve of Fig. 5 of the patent in suit implies that the grinding step has resulted in the removal of the most extreme protrusions of the compacted insulator, because the surface structure shown in that figure seems to be consistent with the statistical distribution of particle sizes which would be expected given the average particle diameters listed in paragraph [0087] of the patent in suit (and thus also those listed in paragraph [0097] of D1).
2.2.5 The board is moreover of the opinion that the above argumentation is entirely consistent with the case law relating to implicit disclosure referred to by the respondent (Case Law of the Boards of Appeal of the European Patent Office, 7th Edition, I.C.3.3). In particular the board can see no basis in the case law for the argument made by the respondent that, if a single embodiment of the prior art method exists which does not result in the alleged implicit feature, then that feature is not implicit. Furthermore, the board is of the opinion that the absence of any experimental evidence in this respect is of no relevance in the circumstances of the present case, in which the methods as described in D1 and the patent in suit are essentially identical.

2.2.6 The board therefore concludes that the method of fabricating a spark plug described in D1 would inherently result in a product in which the surface roughnesses of the insulator and of the glaze layer are within the ranges defined in claim 1 of the patent in suit, so that the subject-matter of that claim is not new according to Article 54 EPC.

3. First auxiliary request - Inventive step (Article 56 EPC 1973)

3.1 The independent claim 1 of the respondent's first auxiliary request differs from that of the main request in that it specifies a narrower range for the surface roughness of the glaze layer, in particular a lower maximum roughness. This narrower range cannot be considered to result inherently from the method of D1 as discussed above, so that the subject-matter of this claim is considered to be new with respect to D1.
3.2 However, D1 discloses in paragraph [0003] that a smooth glaze layer has the advantage of preventing contamination. The board is therefore of the opinion that it would be obvious to the skilled person to attempt to reduce the surface roughness of the glaze layer. Since the present claim 1 merely specifies such a reduction, without defining how it is achieved, the claim defines merely an obvious desideratum, which cannot result in the presence of an inventive step according to Article 56 EPC. In this respect the board notes that there is no suggestion in the patent in suit that any special measures are necessary in order to achieve the lower level of surface roughness defined in this request. The board notes also that the lower limit defined in the claim represents merely the limit of what is feasible without increasing production costs (see paragraph [0018] of the patent in suit), so that this cannot result in the presence of an inventive step.

3.3 The respondent's counter-arguments regarding this request were based on the contribution of the reduced surface roughness to the suppression of flashover described in the patent in suit, in particular that it would not have been obvious to address this problem by reducing the surface roughness of the glaze layer because of the availability of other solutions to that problem, for instance by changing the material of the connection cap. The board does not find this argument convincing, because such considerations would not have led the skilled person away from attempting to follow the clear suggestion contained in paragraph [0003] of D1. Given this conclusion, the further point raised by the respondent that D1 contains no teaching about the rubber or elastomeric cap is not relevant.
4. Second auxiliary request - Inventive step (Article 56 EPC 1973)

4.1 The independent claim 1 of the respondent's second auxiliary request differs in substance from that of the first auxiliary request in two aspects. The first consists of a minor broadening of two ranges for the content of the glaze layer, specifically that of the second ingredient and that of the total content of the zinc component and the at least one of the barium component and strontium component. Since the ranges for these parameters disclosed in D1 are within the narrower ranges of the first auxiliary request, these two amendments are of no relevance for the assessment of inventive step with respect to D1.

4.2 The second aspect of the amendment with respect to the first auxiliary request is the definition of the incorporation in the glaze layer of bismuth and/or antimony, in an amount in a defined range. As defined in the claim this component acts to increase the fluidity of the glaze, which can be seen to be beneficial with respect to the main technical problem addressed by the patent in suit of improving the smoothness of the glaze layer. D1 however provides no suggestion to incorporate either bismuth or antimony into the glaze for this purpose. Indeed in paragraph [0033] it suggests incorporating titanium and zirconium for this purpose.

4.3 As the appellant has argued, the document D1 does disclose bismuth as one of a list of twelve "auxiliary cationic components" (see dependent claim 3 and paragraph [0019]). However none of the examples of that
document include this component, and antimony is not mentioned at all. The only disclosure in D1 of the function of the bismuth component is in paragraph [0021], in which it is indicated that this is effective for lowering the softening point of the glaze. The appellant has argued that the skilled person would understand this as a motivation for selecting this component from the list of auxiliary cationic components, because a lowering of the softening point of the glaze would result in an increase of fluidity. However, in this respect the board agrees with the respondent that, given that the glaze firing is carried out at a temperature at least 200°C higher than the softening point, the skilled person would consider that it could not be assumed that a lowering of the softening point would result in increased fluidity at the firing temperature. Moreover, given the range of softening points of the examples of D1, combined with the knowledge that softening points below a certain value are undesirable from the point of view of spark plug reliability (see for instance paragraph [0059] of D1), it cannot be excluded that a lowering of the softening point would as such be undesirable.

4.4 The board therefore concludes that it would not be obvious to incorporate a bismuth or antimony component into the glaze used in the embodiment of D1 discussed above with respect to the main request, so that the subject-matter of claim 1 of the respondent's second auxiliary request involves an inventive step with respect to that document.

4.5 The only other objection relating to inventive step presented by the appellant is that based on the alleged prior use. However, since it is not disputed that neither of the glazes cited in that respect included
either bismuth or antimony, that prior use, even if it were considered to be adequately proven, would be less relevant than D1 for the assessment of inventive step.

5. Since no other objections have been raised with respect to the respondent's second auxiliary request, the board concludes that, subject to the formal requirements of Rule 82(2) EPC, the patent can be maintained in amended form on this basis. In the light of this conclusion, it was not necessary for the board to consider the respondent's third and fourth auxiliary requests.

6. Apportionment of costs (Article 104 EPC)

6.1 In the decision under appeal the opposition division awarded costs against the opponent for the oral proceedings of 13 September 2007. According to Article 104(1) EPC apportionment of costs against a party (i.e. deviating from the normal case that each party should bear its own costs) should be ordered only if this is appropriate "for reasons of equity". However, the reasoning in this respect in the decision under appeal is limited to a statement that the opponent "offered relevant evidence (the witnesses) only at a late stage ... without explanation, despite having been invited in the summons to the first oral proceedings". There is thus no indication as to whether the division properly took into account the circumstances of the case, in particular that the patent proprietor had made a significant change to his requests in his letter dated 9 July 2007, when exercising its discretion in that respect. The board therefore considers it appropriate to review this aspect of the decision under appeal.
6.2 As noted above, according to Article 104(1) EPC an apportionment of costs should be ordered only when this is appropriate "for reasons of equity". According to the established case law of the boards of appeal, where late submission of facts or evidence is concerned, an important consideration is whether there were cogent reasons justifying the late submission. In the present case the patent proprietor, in his response dated 24 January 2006 to the filing of the opposition, filed a replacement set of claims as his sole request, in which the independent claim was limited to glazes including an antimony component, thus representing a considerable restriction with respect to the claims of the granted patent. The summons to oral proceedings issued by the opposition division on 27 February 2007, containing the invitation referred to in the passage of the decision under appeal cited in paragraph 6.1 above, was based on that restricted set of claims. The patent proprietor then, with letter dated 9 July 2007, which was forwarded to the opponent with letter dated 17 July 2007, reverted to the granted claims as his main request. The board is therefore of the opinion that the patent proprietor's amended requests, which were subsequently admitted into the proceedings by the Opposition Division during the oral proceedings of 13 September 2007, resulted in the opponent being faced with a significantly different situation, namely with claims having a broader scope than those previously pursued by the patent proprietor, and that this change of situation represents a cogent reason which could justify the late submission of the request to hear witnesses, since the opponent must be given a fair opportunity to respond to the patent proprietor's amended requests. In particular, the board does not agree with the argument of the respondent that, since
the patent proprietor had been entitled to revert to
the granted claims at the stage in the procedure when
he did so, the opponent should have been prepared for
such a change of request, because it is not reasonable
to expect a party to be prepared for all allowable
changes of request by the other party. Hence the board
concludes that there are no reasons of equity which
would justify the apportionment of costs with respect
to either of the oral proceedings before the opposition
division, so that the decision of the opposition
division in that respect is set aside.
Order

For these reasons it is decided that:

1. The decision under appeal is set aside including the part relating to the apportionment of costs.

2. The case is remitted to the department of first instance with the order to maintain the patent in amended form in the following version:

   Description: pages 2 to 7, 15 to 18 and 21 to 24 filed as second auxiliary request with letter dated 12 March 2010;
   pages 8 to 14, 19 and 20 of the patent specification.
   Claims: 1 to 5 of the second auxiliary request filed with letter dated 12 March 2010.
   Drawings: Figures 1 to 5 of the patent specification.

The Registrar: U. Bultmann

The Chairman: M. Ruggiu

Decision electronically authenticated