

PATENTS ACT 1977

IN THE MATTER OF an application
under section 72 by Denso
Corporation for revocation of
European patent (UK) no. 0575163
in the name of NGK Spark Plug Co
Ltd

DECISION

Introduction

- 1 The patent in suit, which relates to a spark plug, was granted to NGK Spark Plug Co Ltd (“NGK”) on 18th September 1996, having been filed on 16th June 1993. It claims priority from a Japanese patent application JP157877/92, itself filed on 17th June 1992.
- 2 On 7th September 2001 Denso Corporation (“Denso”) filed an application to revoke the patent on the grounds that the claimed invention was not patentable because it lacked novelty and/or inventive step over certain prior disclosures. NGK filed a counter statement on 17th December 2001, admitting that the invention claimed in at least claim 1 as granted was not patentable, but applying for permission to make certain amendments which, they asserted, would overcome the problem. In a supplementary statement dated 14th March 2002 Denso argued that the proposed amendments should not be allowed for three reasons - they would extend the disclosure beyond that of the application for the patent as filed, the claims of the patent as amended would still lack inventive step, and the behaviour of NGK had been such that discretion to amend should be refused.
- 3 On 22nd May 2002 NGK filed an amended counter-statement with an unconditional revised application to amend. I shall refer to this as their preferred amendment. In case I should refuse their preferred amendment, they also included a “fall-back” amendment to the claims. Denso filed a further supplementary statement on 5th August 2002 maintaining their objections and expanding on them in the light of the revised application to amend. However, they have indicated that they would not oppose NGK’s “fall-back” amendments.
- 4 After the evidence rounds, which themselves involved one preliminary hearing, the matter came before me at a hearing on May 29th and 30th 2003. Denso were represented by Richard Hacon, instructed by Bristows and D Young & Co, and NGK by Douglas Campbell instructed by J A Kemp & Co.

The patent specification and the amendments offered

5 The patent in suit relates to a spark plug for an internal combustion engine in which a firing tip is secured to a front end of a centre electrode, and to a method of manufacturing such a spark plug. In the embodiments described the tip is of a noble metal, such as platinum (Pt), iridium (Ir), Pt-Ir alloy or an iridium based alloy. The tip is joined to the centre electrode by employing a YAG (yttrium, aluminium and garnet) laser beam welding technique to provide a generally annular weld extending around the periphery of the circular interface between the tip and the centre electrode. The laser beam is pulsed such that the weld is formed by overlapping spot welds or spot “shots”.

6 In the patent as granted there are 10 claims. Claim 1 reads:

1. A spark plug (100) comprising a ground electrode (1) and a centre electrode (4) having a front end (4A) with a firing tip (6) welded thereto, the firing tip forming a spark gap with said ground electrode (1), characterised by an annular laser weld extending around the circumference of the external interface between said front end (4A) and said firing tip (6), and into said centre electrode at said external interface.

and there is a further independent claim, claim 10, which reads:

10. A method of manufacture of a spark plug with a ground electrode (1) and a centre electrode (4) having a front end (4A) with a firing tip (6) attached thereto and forming a spark gap with said ground electrode (1), wherein said method includes the step of welding said firing tip (6) to said front end (4A) and is characterised by carrying out the welding around the circumference of the external interface between said front end (4A) and said firing tip (6) such that weld extends partially into said centre electrode (4) at said interface to form an annular weld.

7 Claims 2 to 9 are all appendant to claim 1 and there is no omnibus claim.

8 The preferred amendments requested unconditionally on 22nd May 2002 would change both these claims. Claim 1 as amended (with deletions shown with a line through the text and additions shown in italics) would read:

1. A spark plug (100) comprising a ground electrode (1) and a centre electrode (4) having a front end (4A) with a firing tip (6) welded ~~thereto~~ *to the front end surface (43) of the front end (4A)*, the firing tip forming a spark gap with said ground electrode (1), ~~characterised by~~ an annular, laser weld extending around the circumference of the external interface between said front end (4A) and said firing tip (6), and into said centre electrode at said external interface, *wherein the weld comprises a plurality of overlapping neighbouring spot shots (71) whereby the weld extends around the full said circumference, where A is a depth of penetration of the weld, R is a radius of said firing tip, and wherein a dimensional relationship between A and R is as follows: $R > A\sqrt{3}$.*

whilst claim 10 (renumbered claim 9) would read:

9. A method of manufacture of a spark plug with a ground electrode (1) and a centre electrode (4) having a front end (4A) with a firing tip (6) attached thereto to the front end surface (43) of the front end (4A) and forming a spark gap with said ground electrode (1), wherein said method includes the step of laser welding said firing tip (6) to said front end (4A) ~~and is characterised by carrying out the welding~~ by applying a laser beam *intermittently* around the circumference of the external interface between said front end (4A) and said firing tip (6) *to form a plurality of overlapping neighbouring spot shots (71) such that ~~weld~~ the resultant weld extends around the full said circumference and extends partially into said centre electrode (4) at said external interface to form an annular weld, where A is a depth of penetration of the weld, R is a radius of said firing tip, and wherein a dimensional relationship between A and R is as follows: $R > A \sqrt{R/3}$*

9 NGK have also requested amendments to the subordinate claims and to the introductory pages of the description. I think it is fair to describe all these other amendments as consequential on the changes to the two main claims, and accordingly I do not propose to recite them in detail in this decision.

10 NGK's fall-back amendments would amend claim 1 to read:

1. A spark plug (100) comprising a ground electrode (1) and a centre electrode (4) having a front end (4A) which is constricted as compared with the rest of said centre electrode (4) with a firing tip (6) welded to the front end (4A), the firing tip forming a spark gap with said ground electrode (1), an annular, laser weld extending around the circumference of the external interface between said front end (4A) and said firing tip (6), and into said centre electrode at said external interface,

wherein the weld comprises a plurality of overlapping neighbouring spot shots (71) whereby the weld extends around the full said circumference,

where D is a diameter of said firing tip (6), T is a thickness of said firing tip (6), L is a length of said front end (4A) of said centre electrode (4), A is a depth of penetration of said weld (7), R is a radius of said firing tip (6), and B is a width of said weld (7) measured at an outer surface of both said front end (4A) and said firing tip (6), and

wherein a dimensional relationship between D, T, L, A, R and B is as follows:

0.5mm # D # 1.5mm

0.3mm # T # 0.6mm

0.2mm # L # 0.5mm

$R/3 \# A < R$

0.3mm # B # 0.8mm

11 This adds a number of further dimensional requirements to claim 1 and is effectively the same as claim 6 of the patent as granted when appendant to claim 5. The fall-back amendments also include five subordinate claims, corresponding broadly to subordinate claims in the patent as granted. Under the fall-back amendments, the independent method claim would go. I will put the fall-back amendments on one side for the moment, and concentrate on deciding whether the preferred amendments are or

are not permissible.

Matters in issue

- 12 As I indicated earlier, Denso say the patent and the proposed amendments are open to three objections - the amendments add matter, the claims as amended do not relate to a patentable invention, and the amendments should in any case be refused as a matter of discretion.
- 13 The added matter objection has two limbs. First, Denso say NGK have picked an arbitrary sub-range from a range originally disclosed, something commonly known as intermediate generalisation. Second, NGK wish to amend the main claims by including in them certain parameters out of a list of parameters, and Denso say they can't do that because the parameters were only disclosed as a set, and there was nothing to suggest you could have some of them without the others.
- 14 The patentability objection is based on two documents which, following the convention adopted by the parties, I shall identify as D1 and D2:

D1: A copy and a translation of one of NGK's own earlier Japanese patent applications, no. JP-A-57-151183 published on 18th September 1982.

D2: A copy and a translation of an article entitled "Present State of YAG Laser Welding" published in Japanese magazine "Welding Technique" on 4th August 1982 and disclosing a machine for performing overlapping spot welding

Denso had cited a number of other prior-art documents at an earlier stage of the proceedings, but were no longer relying on them in respect of the proposed amended claims.

- 15 The discretion argument is based on a submission that NGK should have recognised the defects in the original claims much earlier - possibly even before the patent was granted - and should have done something about it then. Because they clung on to claims that they knew, or should have known, were invalid for so long, they should not be allowed to salvage the position now.
- 16 The three objections are largely independent of one another and I shall therefore consider them one at a time. Before doing so, though, I shall first outline the relevant legal provisions and then look generally at the evidence.

The law

- 17 Section 72(1) of the Patent Act gives me the power to revoke a patent on the grounds, amongst others, that the invention is not a patentable invention. What constitutes a patentable invention is set out in section 1. For the purposes of the present case, the only criterion I need to consider is the requirement that the invention must involve an inventive step. That criterion has been the subject of much judicial comment in the

case law, but both sides accepted that the structured approach set out in *Windsurfing International Inc. v Tabur Marine (Great Britain) Ltd. [1985] RPC 59* is an appropriate one to adopt in the present case. That approach relies on four steps:

- (i) identifying the inventive concept embodied in the patent;
- (ii) imputing to a normally skilled but unimaginative addressee what was common general knowledge in the art at the priority date;
- (iii) identifying the differences if any between the matter cited and the alleged invention; and
- (iv) decide whether those differences, viewed without any knowledge of the alleged invention, constituted steps which would have been obvious to the skilled man, or whether they required a degree of invention.

18 Mr Hacon also referred me to *Minnesota Mining v ATI Atlas Ltd. [2001] FSR 514* at p528, where Pumfrey J said that the addressee of the patent specification is the person (or team as it was in that case) likely to have a practical interest in the invention, and to *Pfizer Ltd's Patent [2001] FSR 201* in which Laddie J emphasised that an expert witness cannot be regarded as a typical “normally skilled but unimaginative addressee” but may nevertheless be able to assist the court in assessing possible lines of analysis and deductions that the notional addressee might follow. Mr Campbell drew my attention to *Hallen Co & Anr v Brabantia (UK) Ltd [1991] RPC 198* at p212, where Slade L J pointed out that one cannot assume that the skilled man simply makes technical trials for the sake of so doing.

19 NGK have proposed amendments. The allowance of such amendments is governed by section 75, subsection (1) of which reads:

- (1) In any proceedings before the court or the comptroller in which the validity of a patent is put in issue the court or, as the case may be, the comptroller may, subject to section 76 below, allow the proprietor of the patent to amend the specification of the patent in such manner, and subject to such terms as to advertising the proposed amendment and as to costs, expenses or otherwise, as the court or comptroller thinks fit.

Subsection (2) allows another person - here Denso - to oppose any such amendment.

20 The discretion imparted by section 75 has been the subject of much public debate in recent years, but I have to apply the law as I find it today. Mr Campbell referred me to *Smith Kline & French Laboratories Ltd v Evans Medical Ltd [1989] FSR 561* at page 569 where Aldous J, as he then was, set out the principles on which the exercise of discretion to amend should be based. I can summarize these as follows:

- i) The onus to establish that amendment should be allowed is upon the patentee and full disclosure must be made of all relevant matters.
- ii) Amendment will be allowed provided the amendments are permitted under the

Act and no circumstances arise which would lead the court to refuse the amendment.

iii) It is in the public interest that amendment is sought promptly, so amendment will not be allowed if the patentee delays for an unreasonable period before seeking amendment unless the patentee shows reasonable grounds for his delay (which would include a patentee who believed amendment was not necessary and had reasonable grounds for that belief).

iv) A patentee who seeks to obtain an unfair advantage from a patent, which he knows or should have known should be amended, will not be allowed to amend.

v) The court is concerned with the conduct of the patentee, not the merit of the invention.

21 These principles have been endorsed by the Court of Appeal, notably in *Kimberley-Clark Worldwide Inc v Procter & Gamble Ltd* [2000] RPC 422 and have even more recently been re-affirmed by Pumfrey J in *Instance v CCL Label Inc*. [2002] FSR 27 at p442. Thus whilst Mr Campbell was right to point out that discretion to amend has not often been refused on the grounds of inexcusable delay or covetousness, it has happened in a number of cases and I have a duty to consider those grounds in the present case.

22 I must make one comment on these principles. Mr Hacon based many of his submissions on the presumption that the test in (iii) was whether the patentee knew “or should have known” that amendment was necessary. Strictly, this is the test for (iv), not (iii), and I am conscious that (iv) relates to behaviour that most would regard as more culpable than mere delay as envisaged in (iii). However, it seems to me that in assessing whether the patentee has shown reasonable grounds for delay, it is quite proper to take into account not just what the patentee knew but also what he should have known if he was behaving reasonably. Indeed, Aldous J effectively did that himself in *Smith Kline & French*, because on p577 he says:

“If there be delay in amending by a patentee who knows or ought to know of the need to amend, as is the position in this case, then he must establish a reason for his decision not to amend or to do nothing and also that the reason was reasonable.”

23 As section 75(1) indicates, the allowability of any amendment is subject to the provisions of section 76, and in particular subsection (3) which states:

(3) No amendment of the specification of a patent shall be allowed under section 27(1), 73 or 75 if it -

(a) results in the specification disclosing additional matter, or

(b) extends the protection conferred by the patent.

24 “Additional matter” is defined in subsection (1) as “matter extending beyond that

disclosed in . . . the application for the patent, as filed”. Mr Hacon referred me to *Bonzel v Intervention [1991] RPC 553* at page 574, which states that subject matter will be judged to have been added unless the matter in the patent as granted is clearly and unambiguously disclosed in the application as filed, either explicitly or implicitly. Mr Campbell relied on *Terrell on the Law of Patents, 15th edition*, para. 9.09. This in turn relies primarily on *Bonzel*, but stresses the comment in *Bonzel* that the specification - both as filed and as proposed to be amended - must be viewed through the eyes of a skilled addressee. Mr Hacon also referred me to one other case which I shall consider later.

Evidence

- 25 Both sides have provided evidence from an expert witness. Denso’s expert was Dr Paul Tinwell, Product Development Manager for Federal-Mogul Ignition(UK) Ltd. NGK’s was Mr Junichi Kagawa, Head of Technical Section, Plug Operations Department, NGK. Both experts provided two witness statements in advance of the hearing, and both were then cross examined at the hearing.
- 26 Mr Kagawa has been working for NGK on spark plug development since 1977. He thus has very long experience of this highly specialised subject, and in particular, can speak with direct experience of what was happening in 1992. His one potential disadvantage as an expert in the present case is that he is employed by the defendant and has been throughout. In an ideal world the expert witnesses would always be independent of the parties, but I recognise that is not always possible in very specialised fields where there may only be three or four major players worldwide. He was cross examined with the aid of an interpreter, Mr Hartmut Pilch, and that never makes it easy for the witness nor easy for a hearing officer to assess the witness. However, he came across as knowledgeable and I felt he was being candid in his answers. I was therefore left quite satisfied that he was understood his role as an expert properly and was not simply seeking to promote his employer’s case. Inevitably there were some questions that Mr Kagawa did not seem to have understood fully by the time they have been translated, but I found no difficulty in allowing for that and it does not detract from his evidence.
- 27 I must admit that when I had read Dr Tinwell’s first witness statement before the hearing, I had felt his credentials were less convincing than those of Mr Kagawa because he had not been directly involved in the manufacture of spark plugs at the relevant time (ie 1992). He completed his first degree in mechanical engineering in 1988, having specialised in thermodynamics, internal combustion engines and metallurgy - all good background subjects for the technology of the present patent, but not by themselves making him a spark plug expert. He then worked for Rover Cars on exhaust emissions and “driveability”, before getting sponsorship from Ford Motor Company from 1990 to 1994 for a PhD. During this period - which is the critical one for the purposes of the present patent - he undertook projects on various aspects of cold starting engines which did, he says, included consideration of spark plug design, but it was not until 1995 that he joined his present employer and became heavily involved in spark plug design.

- 28 From his CV, therefore, Dr Tinwell appears to have a lot less overall experience than Mr Kagawa in the narrow specialisation of spark plug design and only limited involvement in this specialisation at the critical period. However, his credibility as an expert witness was enhanced considerably by his performance in the witness box. He described himself as passionate about engineering and that is exactly how he came across, someone who would look in depth into every engineering issue that crossed his path. He left me in no doubt that he had a good understanding of what was going on in the world of spark plugs in 1992, in part because of his naturally-inquisitive mind, in part because it affected the projects he was working on and in part because he had seen it as his responsibility, when he took on his present job, to make sure he understood the history of spark plug design thoroughly. I was also satisfied that he had taken more than a passing interest in welding techniques - he referred, for example, to work he had done in 1982 on metallurgical analysis of welds - though I didn't feel his depth of knowledge was sufficient to make him a welding expert.
- 29 Mr Campbell criticised Dr Tinwell's performance in the witness box, saying he seemed to make up much of his evidence as he went along and questioning why many of his assertions were not in his written evidence. I did not find these criticisms convincing. It is too easy for counsel to ask questions about matters not mentioned in a witness statement, and when the witness answers then accuse him of adding to his original evidence! It is true that things came out in cross examination that had not emerged from Dr Tinwell's witness statements, but I never got the slightest impression that he was making things up on the hoof. Rather, what emerged was that in his witness statement Dr Tinwell had not done justice to his long standing enthusiasm for, and knowledge of, all aspects of engine technology. Dr Tinwell also acknowledged that he had done further research since he wrote his witness statement. In short, I am satisfied that Dr Tinwell was every bit as sound an expert witness for present purposes as Mr Kagawa.
- 30 NGK also filed witness statements from Mr Arata Yagi, principal searcher in the Intellectual Property Department at NGK, Mr Kenji Ishiguro, NGK's patent attorney in Japan, Akio Takami, NGK Director with responsibility for Intellectual Property, Kasumi Ogawa, NGK Section Head dealing with communications with foreign lawyers and companies, and Alan Murray Senior, European Patent Attorney acting for NGK. Much of the evidence from these witnesses goes to the matter of discretion.

Added Matter

- 31 I will now look at the issues in turn, starting with added matter. In addition to *Bonzel*, Mr Hacon also referred me to *Palmasz's European Patents (UK) [1999] RPC 47* at pages 70 to 71. In this case the patentee was trying to limit the scope of a claim by introducing a requirement that a certain set of bars extended in a plane perpendicular to an axis. This feature was disclosed only as part of a construction which also had another set of bars extending parallel to the axis. In refusing the amendment, Pumfrey J said:

“It seems to me that this amendment represents the selection of a particular feature, whose significance is nowhere disclosed, and its incorporation into the

inventive concept shorn of its original concept. This feature is for the first time suggested to have technical significance whether or not in combination with bars parallel to the axis of the stent, and in my view this is an addition of matter to the specification.”

- 32 Mr Hacon had two lines of attack. First, he argued that the limitation which the defendants now seek to import into claim 1, namely that $R > A \text{ } \$/R/3$ is not disclosed in the application as filed which refers instead to $R/3 \# A \# R$. In other words, the application as filed only disclosed that R should be greater than or equal to A; it did not disclose that the case where $R=A$ could be excluded. This, he argued, was a classic “intermediate generalisation” because the range chosen now in the proposed amendments was different to that claimed in the application as originally filed. In response, Mr Campbell contended that in the application as filed simply contains alternatives for the relationship between A and R, ie that $A < R$ or $A = R$. He also said that there is no authority for Mr Hacon’s argument that a patentee cannot narrow down from one range to a subset of that range.
- 33 Mr Hacon’s argument on this point would, quite frankly, be more at home in *Alice in Wonderland*. As Mr Campbell says, the specification as originally filed clearly and unambiguously discloses two alternatives, namely that R could be equal to A or greater than A. Further, even if this is an intermediate generalisation - albeit one that only narrows the range by an infinitesimal amount - Mr Campbell was right to point out that Mr Hacon had failed to come up with any authority that says that intermediate generalisations are banned. I do not think that means intermediate generalisations are always allowable, but rather, whether or not they are allowable has to be determined on a case by case basis by applying the *Bonzel* and *Palmaz* principles. However, applying those principles here, I cannot see any addition of subject matter by excluding the possibility that A could equal R. Likewise I can see no analogy with *Palmaz* because the technical significance of the relationship between R and A was emphasised right from the start, and indeed featured in a subordinate claim.
- 34 Mr Hacon’s second line of attack had a little more substance. He argued that in the original specification, the relationship $R > A \text{ } \$/R/3$ is only referred to in concert with other dimensions of the firing tip and of the weld. I can illustrate this point by quoting the passage in the consistory clauses (reflecting original claim 5) which first mentions the relationship:

“Preferably, where D is a diameter of said firing tip, T is a thickness of said firing tip, L is a length of said front end of said centre electrode, A is a depth of penetration of said weld, R is a radius of said firing tip, and B is a width of said weld measured at an outer surface of both said front end and said firing tip, and wherein a dimensional relationship between D, T, L, A, R and B is as follows:

0.5 mm # D # 1.5 mm,

0.3 mm # T # 0.6 mm,

0.2 mm # L # 0.5 mm,

$R/3 \# A \# R$,

0.3 mm # B # 0.8 mm.

With the dimensional relationship defined as above, it is possible to decrease the required spark voltage with a smaller amount of noble metal, and ensuring a

good ignitability with a minimum amount of spark erosion.”

Mr Hacon submitted that there was no teaching that one can pick and mix amongst these various dimensional relationships to pluck a single one out and emphasis that as inventive.

- 35 Mr Campbell argued that the description, both as filed and as granted, goes on to discuss these dimensions D,T,L,A,R and B separately and recites advantages separately without any indication that there is any particular relationship between them, though obviously the skilled person would recognise that if any one of these dimension increases it could have an effect on other dimensions. He also pointed to the fact that the requirements for D,T,L and B are specified as absolute measurements, whereas the specified relationship between A and R is purely relative. He therefore contended that the skilled addressee would immediately view the relationship between A and R in a different light.
- 36 So which argument is right? The key, I believe, lies in adopting the *Bonzel* approach and reading the original specification through the eyes of the skilled addressee. Yes, the text of the original specification does mention all these dimensional preferences together, but the test is, does the original specification teach the skilled person that all these preferences stand together as one inter-related block? I am quite satisfied the answer is no, for the two reasons that Mr Campbell has given. In particular, when the description gets down on pages 10-13 to explaining why these figures and relationships have been suggested, it addresses each one individually and gives independent reasons in each case. Of course it is easy to say that if you pick some of the dimensions within the specified ranges but others outside you could end up with an incompatible set of dimensions, but you could do that anyway by picking a set of dimensions that are wholly within the specified ranges (for example, B=0.8, T=0.3 and L=0.2: they are all within the permitted ranges, but it is physically impossible for B to be larger than T+L). Thus the point is irrelevant, as the skilled person must be credited with the ability not to pick an impractical combination of dimensions. Further, even if I am wrong on this in respect of the dimensions specified in absolute terms, I am quite sure the skilled person would recognise that the preferences for A and R are different in character because they are relative rather than absolute and thus cannot be dependent on the absolute dimensions.
- 37 I am therefore satisfied that the amendments do not add matter to the patent application as originally filed.

Inventive Step

- 38 I now turn to the question of whether the amended independent claims 1 and 9 lack inventive step. Denso allege that these claims are obvious in the light of document D1 and common general knowledge which, it says, must be taken to include the information in document D2. Of course I also have the benefit of the evidence from the two experts as to what was common general knowledge at the time, but first I will look at D1 and D2.

- 39 Document D1 is, as I have said, one of NGK's own patents, published 10 years before the priority date of the present patent. It too is concerned with joining a tip to the electrode in a spark plug. It recognises that laser welding is in principle well suited to welding operation like this, where one is dealing with very small parts. However, it points out that there is a risk of getting air bubbles in the weld, and that unless the tip is mechanically clamped in place during the laser welding - and that is difficult - it can distort. It gets round these problems by initially "tacking" the tip in place using electric or friction welding, and only then forming the main weld using laser welding. In some of the embodiments the laser weld is annular, as required by the present claims. There is no discussion of the radial depth of the laser weld, though from the drawings it does not seem that it was expected to go very deep. Whether it was envisaged that it would have penetrated as far as $R/3$ is impossible to say because the drawings are not sufficiently accurate, and indeed do not even purport to be showing weld depth to scale.
- 40 Document D2 is a magazine article from roughly the same time, discussing YAG laser welding in general. It points out that YAG lasers are ideally suited to "micromachining" applications because of their ability to produce a microspot with high energy density. It also says that welding had become one of their major applications. It then goes on to explain that they can be operated in pulse or continuous mode, but that the pulse mode has tended to predominate because it is easier to get the high energy density required. As the illustrations in the article show, it is pulse welding that produces the overlapping spot welds required by the present claims. Mr Hacon argued that D2 was in reality a promotional article for a particular welding machine. Even if that is true, it does not undermine the broad thrust of the general information it is giving, bearing in mind that this article appeared in a general welding magazine.
- 41 So much for the documentary prior art. I must now turn to the *Windsurfing* steps. The first one requires me to identify the inventive concept. There was no real dispute between the parties that the inventive concept must be regarded as the use of overlapping-spot laser welding to join the firing tip to the electrode with an annular weld whose depth is greater than or equal to $R/3$ but less than R .
- 42 For the second step, I must first establish who should be regarded as the skilled addressee for the patent in suit. Mr Hacon submitted that a team comprising not only personnel skilled in the art of spark plugs but also personnel skilled in the art of laser welding would be needed. Mr Campbell, however, said this begged the question as to whether it was obvious to use laser welding at all in 1992. Mr Campbell's argument would have force if D1 did not exist. However, I am starting with D1, not with a clean sheet, so the question becomes, is it reasonable to expect the spark plug expert, faced with D1 and wanting to put its teaching into practice, to call in a laser welding expert? Now Mr Kagawa was in fact the inventor of D1, but it would appear from his evidence that he probably did not rely on help from welding experts. However as *Pfizer* makes clear, the test is not what one particular expert did but what the notional skilled but unimaginative addressee would have done, and I have little doubt that the skilled addressee could be expected to seek help from a welding expert. Accordingly, I am satisfied that the skilled addressee must be regarded as a team including both a person skilled in the art of spark plugs and a person skilled in the art of laser welding.

43 To complete the second *Windsurfing* step, I must establish what would have been common general knowledge to this skilled but unimaginative team. There are two elements to this, reflecting the two parts of the team - what the spark plug member would have known and what the welding member would have known. To answer this, I must look not only at D2 but also at the evidence from the expert witnesses. The witnesses are, of course, both essentially spark plug experts rather than welding experts.

44 Dr Tinwell said that spark plugs with laser welded tips were known by 1992 because he had bought a spark plug which from close inspection he considered to be laser welded in 1985 or thereabouts. However, his recollection was that he bought the plug for use in a specialist vehicle, a vehicle for moto-cross competition, and he agreed that laser welded spark plugs were not commonly supplied to vehicle manufacturers, at least in Europe, in 1992. Mr Kagawa's evidence is consistent with this because he states in his written evidence that he thinks Denso were laser welding spark plug tips before 1992, but that laser welding was not commonly used for this purpose. I am therefore satisfied that it would have been common general knowledge to the skilled spark plug addressee that laser welding of tips was not only possible but had been done, but that the technique had not yet found its way into what I might call the mass market.

45 We have no direct evidence from a welding expert as to what he would have regarded as common general knowledge, but we have indirect evidence in D2. This to my mind provides strong evidence that someone skilled in welding techniques would be very familiar with the fact that laser welding was well suited to welding small objects and that there were two ways of doing it - using a continuous beam, and using a pulsed beam to create overlapping spot shots - each with its pros and cons. That view is reinforced by Mr Kagawa's evidence because, even though he does not claim to be a welding expert, he admits that even in 1981/2 (and certainly by 1992) he was aware that laser welding could be done using a continuous or pulsed beam. He said he was not aware of welding by overlapping spot shots, but I suspect that points to his very limited knowledge at that time of pulsed laser welding, since no-one has suggested that pulsed laser welding could be used in a way that does not rely on creating overlapping spot shots.

46 For the third *Windsurfing* step I must consider the differences between the relevant prior art - which in this case is D1 - and the alleged invention. D1 discloses welding the tip to a spark plug with an annular laser weld, but it does not say whether it uses continuous or pulse welding and does not disclose the depth of penetration. Accordingly, it was common ground between the parties that the differences are:

- that the annular weld comprises a plurality of overlapping neighbouring spot shots; and
- that the depth of penetration of the weld is such that $R > A\sqrt{R/3}$

and on that basis I must now turn to the fourth step and consider whether these differences would have been obvious to the skilled team.

- 47 What I have found to be common general knowledge to the welding expert in the skilled team points strongly to the conclusion that the first of these differences was obvious in 1992. Pulse laser welding to create overlapping spot shots was, after all, one of only two options available, and with no indication in D1 as to which one to prefer, there would have been no reason for the skilled team to reject one of the options without even trying it.. However, it was put to me that there are two factors which suggest this conclusion may be unsafe.
- 48 First, Mr Kagawa chose a continuous wave laser in 1982 to construct the spark plug of D1, not a pulsed one even though he was aware the latter existed. However, that cannot be conclusive evidence that use of overlapping spot shots was not obvious, in part because that was in 1982, not 1992, but more importantly because of the *Pfizer* principle that I quoted earlier: what any particular expert may or may not have done does not establish what the notional skilled person may have done. As I have already observed, Mr Kagawa's knowledge of pulse laser welding appears to have been limited, and that maybe why he plumped for a continuous laser. Indeed, Dr Tinwell considered that in failing to consider pulse welding for the D1 spark plug, Mr Kagawa "missed a trick" and that, he suggested, may be why the development of D1 was abandoned.
- 49 Second, it was alleged that laser welding cannot have been obvious in 1992 because once NGK's successful technique for laser welding had been introduced, laser-welded spark plug tips had revolutionised spark plug production in the mid 1990s. However the evidence that emerged during cross examination of the experts cast serious doubt in my mind on cause and effect here. It emerged that possible materials for the firing tip of the spark plug were iridium, platinum or an alloy of the two. Both Dr Tinwell and Mr Kagawa agreed that if the tip were iridium then laser welding was the only feasible welding technique, if platinum then friction welding could be used, and if an alloy of the two then it would depend on the proportion of the constituents. It also emerged that there were growing demands from vehicle manufacturers for a longer lasting plug, which required spark plug manufacturers to turn increasingly to iridium tips. This evidence left me with the strong impression that what drove the "revolution" in the 1990s was not some sudden realisation that laser welding was the industry's holy grail, but rather, the pressure to use iridium for the tips which inevitably required manufacturers to turn to laser welding. It does not therefore provide evidence that pulse laser welding to create overlapping spot shots cannot have been obvious.
- 50 Accordingly I do not agree that these two factors undermine my *prima facie* conclusion that use of overlapping spot shots was obvious at the relevant time. I should perhaps say that some apparent support for this came from Dr Tinwell's evidence, because he said in cross-examination that, during research before writing his witness statement, he consulted laser welding specialist companies GSI and Micrometric Techniques Ltd regarding the state of knowledge in 1992, and that they had told him that YAG pulsed laser welding would have been the obvious choice to weld a noble metal spark plug tip to an electrode in 1992. Dr Tinwell did not, though, give full details of his enquiry, eg exactly what questions he asked and what background he gave them, and without such details I do not feel I can attach any weight to this.
- 51 However, we are only half way there. I have found that one of the two differences

between D1 and the alleged invention was obvious at the relevant time, but what about the requirement that the radial depth of the weld be within the specified range?

- 52 Figure 6 of the patent specification shows how the durability of the weld varies with the radial depth of the weld. Durability is measured by the number of test cycles of an engine using the plug before the tip falls off. It shows that the durability increases as the depth increases, reaching 10,000 cycles when the weld depth is $R/3$. It would appear that no tests were continued beyond 10,000 cycles, so the figure does not establish whether durability would continue to increase as the depth increases beyond $R/3$ or whether some sort of plateau is reached. Mr Hacon spent some time cross examining Mr Kagawa on figure 6 in an attempt to establish that the selection of weld depth was merely an obvious choice flowing from the durability required by the engine manufacturer, and indeed Mr Kagawa accepted that whilst Honda wanted tips tested to a certain number of cycles, Toyota wanted them tested to a different number of cycles. However this line of cross examination seemed to me to be missing the point because it presupposed the skilled person had already established that durability would have increased with weld depth in the manner shown in figure 6. It also presupposes that the skilled man has already decided to go for laser-only welding. The issue is whether, without knowledge of figure 6, and starting from D1 (which does not disclose laser-only welding), it would have been obvious to try a weld depth within the required range.
- 53 The latter is a point on which the evidence of a welding expert could have been really valuable, but I do not have that evidence. All I have is a number of comments from Mr Kagawa and Dr Tinwell, neither of whom pretend to be welding experts but both of whom profess some knowledge of welding technology. There was one aspect on which they were agreed, and that is that there is a trade off between making the weld deep, which in principle will strengthen the join, and not going so far that the materials are damaged by overheating, which would weaken the join. However, that does not by itself tell us whereabouts in the possible range of depths the skilled team would have expected the optimum depth to be - in other words, what range of depths it would have been obvious in 1992 for the skilled team to try.
- 54 In his witness statement, Mr Kagawa expressed the view that if in 1992 a skilled person contemplated attaching spark plug tips solely by laser welding, he would have gone for a weld depth just greater than the radius so as to create a weld over the whole of the abutting surfaces, and he would not have contemplated reducing the weld depth so as to end up with an annular weld. In cross examination, however, he said that the skilled person looking at D1 (which of course shows a shallow, annular laser weld) would not have expected a deeper weld to be successful because of overheating problems. Now I am aware that in one instance he is talking about a laser-only weld and in the other about a laser weld which follows an initial resistance weld, but even allowing for that, these two responses are not easy to reconcile and reinforce my feeling that Mr Kagawa's knowledge of laser welding in 1992 was limited. I do not therefore feel I can accept with any confidence his views on what welding depths it would have been obvious for a welding expert to try in 1992.
- 55 Dr Tinwell's evidence on this point is, unfortunately, also weak. In his witness statement he says that the skilled addressee would seek to increase the depth of weld

until the point was reached where the tip and electrode were being damaged, but in the very next paragraph - and still in the same context - he asserts that the skilled team would have started with a full-depth weld but then investigated reducing the depth to reduce the cost of manufacture. This gives me little confidence in Dr Tinwell's ability to tell us what welding depths would have been obvious either. Because of that, I attach little weight to his assertion that trying a depth within the required range would have been wholly routine. Indeed, there is another problem with this assertion by Dr Tinwell: it appears to presuppose that the skilled addressee is trying to make the weld solely by laser, whereas the skilled addressee, it must be remembered, is actually starting with D1 which does not rely solely on laser welding. I cannot assume that what may be obvious for a wholly-laser-welded tip is also obvious for a partially-laser-welded tip. True, Dr Tinwell did say in cross examination that an engineer in 1992 would have tried to avoid two welding steps to save costs and because a laser weld was better, but I felt this statement was being made with a hefty dose of hindsight. In any case that would have required three steps, not just two, to get from D1 to something within the scope of the claim, making the obviousness argument even weaker.

- 56 Mr Campbell made great play of the fact that Denso had not provided any evidence of what they themselves were doing in 1992, inviting me to infer that they would have read D1 and, in a highly competitive market, would have come up with the invention themselves if it was all so obvious. That argument is misguided, because what matters is what the notional skilled team would have regarded as obvious, not what any particular person or company would have regarded as obvious. It also lacks evidential support because there is no evidence of the market conditions in 1992 - certainly in 1996 conditions were not so cut throat that Denso weren't prepared to sit down with NGK to try and agree some licensing deals.
- 57 I have re-read the statements of the two expert witnesses carefully and gone through the transcript of their cross examination, but I am not satisfied that this evidence establishes a weld depth within the required range would have been obvious in 1992 to a skilled team which had D1 in front of them. Accordingly, as this is the only relevant evidence available to me, the obviousness challenge against claims 1 and 9 as proposed to be amended fails.

Discretion to allow amendment

- 58 I now have to consider whether I should exercise the comptroller's discretion to allow the amendments requested by NGK. I must do so on the basis of the principles set out in *Smith Kline & French*.
- 59 Mindful of the first principle, NGK have gone to some lengths to make a fairly full disclosure of potentially relevant matters. In particular they have disclosed the background to the decisions they made during prosecution of the patent application and also during their subsequent discussions with Denso leading up to these proceedings. They have submitted transcripts of relevant conversations and drawn attention to further prior art that might possibly be considered relevant. Whilst with hindsight there might be one or two aspects on which a little more detail might have been helpful, they have not been miserly in the information they have disclosed and I did not get the impression that Denso were seriously questioning whether they had made the

requisite full disclosure of all relevant matters. The only information which NGK were not willing to disclose was the advice given to them by their UK patent agent JA Kemp in January 2000, and that is because they claimed privilege in relation to it, referring me to *Oxford Gene v Affymetrix (No.2) [2001] RPC 18*. Denso did not challenge this, and I accept that no adverse inference should be drawn from their declining to disclose this advice.

- 60 It is also necessary that the amendments should be permitted under the Act. Having already found that the amended claim relate to a patentable invention and that the amendments do not add matter, I do not think there can be any further argument about this.
- 61 The main thrust of Denso's case on discretion was that the amendments had not been sought promptly once NGK knew, or should have known, that amendment was necessary. They pinned delay to three stages in the life of the patent, firstly shortly after the filing of the Japanese equivalent patent application in 1992, secondly just before the grant of the European patent in 1996, and thirdly when Denso said in 2000 that they would apply for revocation of the patent in suit. At each of these stages, say Denso, D1 had come to NGK's attention in relation to the patent or one of the other members of the same patent family, and NGK either did realise or should have realised that the protection they were seeking or had obtained was broader than was justified in the light of D1. Their failure to do anything, Denso argue, amounts to culpable delay which warrants refusal of the amendment now.
- 62 I must look at the facts in more detail, starting with 1992. Mr Yagi, from NGK's in-house patent department, says that when he gave instructions in May 1992 to file the Japanese equivalent of the patent in suit, he had completely forgotten about D1, over 10 years having passed since its filing and also it having been subsequently abandoned. Mr Ishiguro, the Japanese patent agent who received the instructions, states that at that time he did not know of D1 at all and it was not cited on NGK's inventor notification form. Denso do not take issue with that. However, D1 did come to the attention of both Mr Yagi and Mr Ishiguro six months later because it was referred to in an invention notification form for a related invention which gave rise to another Japanese patent filing. Both Mr Yagi and Mr Ishiguro admit that this made them think briefly about the relation between D1 and the previous filing, but both say they decided it was not relevant because they saw D1 as relating to a different welding technique, requiring a two-stage welding operation.
- 63 The next critical date is in 1996. The patent in suit was about to be granted by EPO, who had not cited D1 at any time, when the Japanese Patent Office cited D1 against the Japanese equivalent. NGK decided to amend the Japanese patent application, but took no action in relation to the European patent. To be fair, it may well have been too late to amend the European patent application pre-grant, as the EPO had issued its "rule 51(4) letter", saying that the patent was ready for grant, on 30th November 1995 and the Japanese Patent Office did not cite D1 until 14th March 1996, but of course they could have sought amendment after grant.
- 64 Again, the two key players on NGK's behalf were Mr Yagi and Mr Ishiguro. Mr Yagi says that he considered the Japanese Patent Office to be stricter than the European

Patent Office and consequently, he did not consider that when the Japanese Office raised an objection, it was always necessary to amend corresponding foreign applications. In this particular case, he thought - as he had in November 1992 - that the production technology of D1 was fundamentally different from that of the present invention. Mr Ishiguro says much the same thing, albeit in different words. He did not therefore consider checking with the agents handling the European patent application whether that might need to be amended.

65 This evidence was not challenged, but Mr Campbell pointed out that it was in any case supported by one aspect of the behaviour of Mr Yagi and Mr Ishiguro: they did not take any steps to bring D1 to the attention of the US Patent Office in respect of the corresponding US patent application, even though they must have known of the strict requirements of USPTO as regards the disclosure of relevant prior art. That, said Mr Campbell, shows they did indeed take the view that D1 was not really relevant.

66 The third important event as regards discretion took place during the bipartite discussions between NGK and Denso in 2000. It would appear that discussions between the two companies about their patent portfolios had been going on for several years, but it was on 12 January 2000 that NGK brought the patent in suit into the discussions. We have no direct evidence as to what NGK actually said about the patent on 12 January, but we have indirect evidence from an e-mailed response that Denso sent to NGK the following day:

“The materials that you showed yesterday stated that your company’s EP patent in Europe is in a very strong position *vis-a-vis* Denso, because it is not subject to restrictions such as those in the corresponding Japanese patent application. The claims in the Japanese patent application were limited by the existence of known technology (Japanese Laid-Open Patent Application S57-151183) during the examination process, and this known technology is similarly valid to hold against then EP patent as well. Therefore the present claims are invalid as they contain known technology. Because of this, we cannot help thinking that your judgment/assertion that your patent is very strong is groundless.”

67 This leaves me in no doubt that NGK had been trying to obtain an advantage from their patent during the discussions on the previous day. I do not know quite how they were trying to exploit it, but I do not need to go into that. Moreover, they were clearly very conscious of the fact that whilst they had had to restrict their Japanese patent, they had not had to restrict their European patent.

68 NGK admit (through the evidence of Mr Takami) that Denso’s response caused them to realise that “it was possible that amendments might be necessary”. They sought advice from their European patent agents, JA Kemp & Co. Whilst, as I have explained, that advice is privileged and has not been disclosed, Mr Hacon said I was entitled to infer what the advice was from the fact that NGK subsequently applied to amend. I feel it would be wrong for me to speculate in this way, but in any case I do not need to do so because Mr Takami effectively concedes in his evidence that NGK recognised amendment was necessary. I say this because, in respect of the ensuing period he says that because they were trying to do a deal with Denso (or, as he put it, hoping “to achieve mutual harmony”), “we did not at the time act to effect the relevant

amendments”, and also that he thought Denso might have other relevant prior art “which could influence the choice of appropriate amendments”. That to my mind is a clear admission that NGK knew by this stage that the patent was bad.

69 There appears to have been no further discussion between the two sides about the validity of the patent until February 2001, when NGK, having tacitly accepted that claim 1 was invalid, asked Denso why they thought the other claims were also invalid. Denso said they would prepare a summary before the next meeting, but in the event the next action was Denso’s application in September 2001 to revoke the patent. This eventually resulted in NGK’s application to amend, in December 2001.

70 So much for the history. The question I must consider is that posed by the third principle in *Smith Kline & French*. Has there been unreasonable delay in seeking amendment, for which the patentee can show no reasonable grounds?

71 I turn first to November 1992, when Mr Yagi and Mr Ishiguro admit that they considered D1 in relation to the present patent. (I should say that the parties seemed to accept that these two individuals stood in the shoes of NGK. Whether that is strictly true of Mr Ishiguro, who as I understand it was not an NGK employee, I do not know, but it is certainly true of Mr Yagi.) Mr Hacon submitted that it was surprising that two patent experts could be so dismissive of D1 as it clearly anticipated the claims of the Japanese application that had been filed. In saying that, I do not think he was suggesting Mr Yagi and Mr Ishiguro were lying about their thoughts in 1992 because their evidence has not been challenged. Rather, he was inferring that they should have realised the claims were bad even at that early stage. I am inclined to agree that they probably should have realised, but I must accept their evidence that they did not. Indeed, I can understand how the fact that D1 has a two-stage welding process could have blinded them to the possibility that it could nevertheless still be relevant to the claims of the patent in suit. Thus I think NGK have shown reasonable grounds for not seeking amendment at that stage.

72 I have more difficulty with events in 1996. Mr Hacon argued that once NGK had accepted that D1 was sufficiently relevant to justify amending the Japanese patent, they were under an obligation to seek advice from someone skilled in European patent law as to whether the patent in suit was in danger from D1. He says their failure to do so was turning a Nelsonian blind eye to the issue. That analogy may not be wholly apt, but I agree that their failure to consider the potential impact of D1 on the non-Japanese equivalents is not the attitude of a responsible patentee, even allowing for Mr Yagi’s belief that the Japanese Patent Office was stricter than most. Rather, it is the attitude one would expect of a patentee who wants to keep his patent portfolio as broad as possible, irrespective of whether the patents were valid. The fact that NGK did not even notify the USPTO, far from exonerating them as Mr Campbell suggested, in my mind only reinforces their culpability.

73 Accordingly, I do not feel NGK have shown reasonable grounds for not seeking amendment in 1996, as required by the third *Smith Kline & French* principle. True, they may not have known that the patent needed amendment in the sense of having received specific advice that it needed amendment, but that is only because they deliberately chose not to look at the issue despite knowing there was a question mark

over validity, and that does not strike me as “reasonable grounds” for not seeking amendment.

- 74 I should say in passing that the NGK’s attitude when they spoke to Denso on 12 January 2000 underlines the fact that the failure to amend the European patent was not a mere oversight. They were very conscious of the fact that they had maintained broader claims in their European patent and were trying to exploit that fact. Indeed, it seems to me that there may be a case for saying they also fell foul of the fourth principle at this meeting. However, this point was not argued, so I shall not consider it further.
- 75 Mr Hacon also made much of the delay between 13 January 2000, when Denso confronted NGK with D1 and JA Kemp’s advice was finally sought, and May 2002 when NGK submitted the unconditional amendments that I have considered above. I think the proper period to consider is that from 13 January 2000 to 17 December 2001, when NGK filed their original unconditional request to amend, because it was at this stage that the key amendments to get round D1 were submitted. Mr Hacon described the December 2001 amendments as “what they could get away with”, but that is unfair. The only material addition in the amendments of May 2002 was the further restriction that A<R to deal with a criticism raised by Denso, and NGK responded to that criticism reasonably promptly.
- 76 NGK have not really provided any justification for what was close on a two year delay in applying for amendment once Denso had brought D1 to their attention. The best they can come up with is that they were hoping to do a deal with Denso, and/or they weren’t sure whether further prior art might come to light. The former shows a total disregard for the positions of third parties. The latter might justify some short delay after they asked Denso for comments on the other claims in February 2001, but it leaves unexplained the delay for the preceding year, let alone the long additional delay before amendments were submitted.
- 77 Mr Campbell pointed out that there was no great harm done in delaying amendment, in that NGK was not enforcing the patent with any vigour. Mr Hacon, however, rightly referred me to *Smith Kline and French* (page 577) where Aldous J says explicitly that the harm done is “not a consideration”. In any case, the fact that NGK may not have been pressing Denso over the patent is no proof that no harm was done, because there are other spark plug manufacturers, and we do not know what effect the existence of the patent may have been having on their business plans. In short, NGK have not shown reasonable grounds for the delay since January 2000, so this delay too falls foul of the third *Smith Kline & French* principle.

The fall-back amendments

- 78 I have found that the preferred amendments requested by NGK do not add matter and that the invention of the amended claims would involve an inventive step. However, I have found that the conduct of NGK has been such that discretion to amend should be refused. The conduct in question was the failure, without good reason, to seek amendment promptly following the citation of D1 by the Japanese Patent Office in

1966, and then again when Denso had brought D1 to their attention in January 2000.

79 However, so far I have only considered the preferred amendments. NGK's fall-back position would, as I explained earlier, restrict claim 1 still further by effectively coming down to claim 6 as granted when appendant to claim 5.

80 Denso raise no objection to the fall-back amendments. Certainly their main added subject matter objection is not applicable to these amendments, and they have also offered no evidence to challenge the inventiveness of claim 1 as thus amended. On discretion, they say that the fall-back amendments are tantamount to deleting invalid claims from the original specification to just leave valid ones, and that there has long been a distinction between deleting an invalid claim, which will be allowed unless there is serious misconduct in the form of bad faith, fraud, dishonesty or insincerity, and amending by reformulating invalid claims as was the case with NGK's preferred amendments. On this basis, they do not argue that the fall-back amendments should be refused on discretionary grounds.

81 Responsibility for exercising discretion properly rests with me, and so I do not think I should simply take Denso's view of the matter as conclusive. After all, Denso may not be objecting because the narrower claim simply doesn't affect their interests, but that may not be so for other spark plug manufacturers. I therefore feel I must give some consideration to the question of discretion in relation to the fall-back amendments even though Denso are not pushing it.

82 The view that deleting invalid claims can be treated more leniently than validation by reformulation has a long history, which Pumfrey J discussed in *Palmaz* at pp 61-2. He went on to question whether the distinction between the two forms of amendment was really justified. I have to say that does indeed strike me as a question that deserves serious consideration. In the present case, NGK's preferred amendment would effectively have amended claim 1 to bring in part of a subordinate claim whereas their fall-back amendment would bring in the whole of a subordinate claim, and I am at a loss to understand why the former should be subject to a higher discretion threshold than the latter.

83 However, I am conscious of the fact that Pumfrey J's comments on this in *Palmaz* were *obiter* and I am therefore bound by the approach taken in a long line of previous judgments. As Denso acknowledge, under this approach conduct much worse than NGK have shown in the present case must have occurred for refusal of the amendments to be justified. Accordingly I allow the fall-back amendments.

84 That is not quite the end of the matter because the fall-back amendments are incomplete in the sense that they necessitate consequential amendments in the description, particularly to the consistory clauses, and NGK have not yet offered such amendments. They may have feared that going beyond the deletion of invalid claims may have lost them the benefit of the higher discretion threshold, but I feel the public interest would not be well served by allowing amendments which leave the claims and description inconsistent with one another. Accordingly I am going to allow NGK an opportunity to submit appropriate consequential amendments. I do not think they are likely to be controversial.

Conclusion

- 85 In conclusion, I decline to allow NGK's preferred amendments but am prepared to allow their fall-back amendments subject to suitable consequential amendment of the description. Accordingly I allow NGK 28 days in which to submit a revised application to amend which includes the fall-back amendments already offered plus the necessary consequential amendments to the description. The revised application should be copied to Denso, who will have 14 days in which to raise any objections. Assuming there are none, and assuming I am satisfied the amendments to the description achieve what is required, I will allow the amendments to be made without further advertisement. Should there be any query with the amendments, I will give further directions on how matters should proceed. Should NGK fail to submit a revised application to amend, as they have acknowledged that the patent as unamended is invalid I will revoke it.

Costs

- 86 Although Denso have lost on some issues, they have won overall and are entitled to a contribution towards their costs. Both parties agreed that costs should be on the Comptroller's standard scale. I do not feel the issues on which Denso has lost warrant a significant adjustment, and moreover, any such adjustment would be offset by the fact that they were put to the trouble of filing a second statement once NGK had submitted amendments. Accordingly I order NGK to pay Denso £3000.

Appeal

- 87 Under the Practice Direction to Part 52 of the Civil Procedure Rules, any appeal must be lodged within 28 days.

Dated this 28th day of October 2003

P HAYWARD

Divisional Director acting for the Comptroller

THE PATENT OFFICE