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D E C I S I O N
of 13 February 2004

Case Number: T 0703/01 - 3.2.6

Application Number: 94905365.6

Publication Number: 0730506

IPC: B23K 10/00

Language of the proceedings: EN

Title of invention:

Process for high quality plasma arc and laser cutting of
stainless steel and aluminum

Patentee:

HYPERTHERM, INC.

Opponent:

L'AIR LIQUIDE, SOCIÉTÉ ANONYME POUR L'ÉTUDE ET L'EXPLOITATION
DES PROCÉDÉS GEORGES CLAUDE

Headword:

-

Relevant legal provisions:

EPC Art. 56, 107, 108

EPC R. 65

Keyword:

"Admissibility of the appeal - appellant adversely affected
(yes) - sufficient grounds (yes)"

"Inventive step (yes)"

Decisions cited:

T 0825/00

Catchword:

-



Case Number: T 0703/01 - 3.2.6

D E C I S I O N
of the Technical Board of Appeal 3.2.6
of 13 February 2004

Appellant: HYPERTHERM, INC.
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 12 April 2001
revoking European patent No. 0730506 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: P. Alting van Geusau
Members: H. Meinders
M. J. Vogel

Summary of Facts and Submissions

I. European Patent Nr. 0 730 506, granted on application No. 94 905 365.6, was revoked by the Opposition Division by decision posted on 12 April 2001. It based the revocation on the finding that the subject-matter of independent claim 8 of the patent as granted did not involve an inventive step. The subject-matter of independent claims 1 and 11 was considered to be novel and to involve an inventive step.

In arriving at this conclusion it referred in particular to the following documents:

D3: Hommes et Fonderies, No. 26 June-July 1972, "Utilisation des plasmas d'arc pour le coupage des métaux", M.G. Vagnard, and

D6: JP-A-2 867 158 with English translation (D6').

From the opposition proceedings the Board considers the following document to be further relevant:

D2: Welding Journal, February 1984, "How plasma arc cutting gases affect productivity", W.S. Severance and D.G. Anderson.

II. The Appellant (Patentee) filed a notice of appeal against this decision as well as a statement of grounds of appeal and paid the appeal fee on 11 June 2001.

The Respondent (Opponent) replied to the statement of grounds of appeal with letter of 4 September 2001.

III. Oral proceedings were held on 29 January 2004.

The Appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the following documents:

claims 1 to 11, filed during the oral proceedings,

description, columns 1 to 8, page 2a, filed during the oral proceedings,

Figures 1 to 4, filed during the oral proceedings.

The Respondent requested that the appeal be dismissed.

IV. Independent claim 1 of the patent according to the request of the Appellant reads:

"A metal cutting process for use with a cutting torch (16) for producing a high quality kerf (12) in stainless steel and non-ferrous workpieces (14) that have an upper surface (14a) adjacent a cutting torch and a bottom surface (14b) opposite the torch, where the torch (16) uses a total gas flow to the kerf (12), comprising, forming a portion of the total gas flow from a reducing gas, and adjusting the ratio of said reducing gas flow to said total gas flow based on the thickness of the workpiece (14) prior to cutting to thereby produce during cutting a predominantly reducing atmosphere through the kerf (12) and a predominantly oxidizing atmosphere generally at the region (28) defined by the bottom surface and the kerf".

Independent claim 8 (text of claim 11 as granted) reads as follows:

"A process for producing a high quality cut in sheets (14) of stainless steel and non-ferrous metals with a cutting torch (16) located opposite an upper surface (14a) of the sheet and cuts a kerf (12) that extends to a bottom surface (14b) of the sheet and wherein the torch (16) has a total gas flow from the torch to the kerf (12), comprising,

forming said plasma gas at least in part of a reactive gas, forming said total gas flow at least in part of a reducing gas, and

controlling the ratio of the reducing gas flow to the total gas flow based on the thickness of said sheet (14) prior to cutting such that the reducing gas is consumed in the kerf (12) during cutting leaving a negligible concentration of said reducing gas at said bottom surface (14b)".

V. In support of its request the Appellant argued essentially as follows:

The appeal was admissible in terms of Rule 64 EPC as it included "the extent to which amendment or cancellation of the decision" was requested. Instead of revocation of the patent (which was occasioned by independent claim 8 as granted not involving an inventive step) the patent should be maintained on the basis of independent claims 1 and 11 as granted (of which the opposition division had considered in its decision that they fulfilled the requirements of the EPC in respect of

novelty and inventive step). It was not necessary to contest the decision under appeal in respect of claim 8 as granted, as argued by the Respondent, to fulfill the requirements of Articles 106 to 108 EPC. It was sufficient to create a new fact (in this case the withdrawal of claims 8 to 10 of the patent as granted) such that the decision under appeal was no longer applicable.

Novelty and inventive step of the subject-matter of present claims 1 and 8 (= claim 11 as granted) was acknowledged by the Opposition Division in the decision under appeal.

Even when considering D6' in combination with D3 it was not obvious to form a portion of the total gas flow from a reducing gas prior to cutting such that a predominantly reducing atmosphere was achieved through the kerf and a predominantly oxidizing atmosphere generally at the region defined by the bottom surface and the kerf (claim 1) or such that the reducing gas was consumed in the kerf during cutting leaving a negligible concentration of said reducing gas at said bottom surface (claim 8).

Neither D3 nor D6' mentioned bottom dross, thus even taking account of the proposed use of hydrogen as the reducing gas there was no indication to which effect the hydrogen had. Therefore one could not conclude that there was a predominantly reducing atmosphere in the kerf and the predominantly oxidizing atmosphere in the region defined by the bottom surface and the kerf, as presently claimed.

D2 mentioned hydrogen together with argon in the total gas flow in connection with bottom dross, however only in connection with cutting aluminum alloys.

Thus there were no direct indications available to the skilled person as to how to achieve both a sheeny surface and no bottom dross at the same time, taking account of the thickness of the sheets to be cut.

VI. The Respondent argued essentially as follows:

The appeal was not admissible as it did not supply the grounds of appeal (Article 108 EPC) in the sense that it did not argue nor provide facts why the decision under appeal was wrong. In accepting the decision by deleting claims 8 to 10 as granted, which had formed the basis for the decision of the Opposition Division to revoke the patent, it did not contest the decision and thus was not adversely affected by the decision (Article 107 EPC). In addition, it should have argued why the subject-matter of claims 1 and 11 as granted involved inventive step.

If the skilled person would apply the teaching of D3 to the cutting process disclosed in D6' to increase the amount of hydrogen in the total gas flow when increasing the thickness of the material to be cut, as argued by the Opposition Division against claim 8 as granted in the decision under appeal, the result would be that the kerf would be substantially sheeny and that no bottom dross would be formed. However, that result could only be achieved when the amount of hydrogen in the total gas flow was such that there was a predominantly reducing atmosphere in the kerf and a

predominantly oxidizing atmosphere at the region defined by the bottom surface and the kerf, i.e. that the reducing gas was consumed in the kerf, as claimed in present claims 1 and 8.

In that respect page 5, first paragraph of D6' stated that when cutting stainless steel the generation of a reducing atmosphere (of hydrogen) prevented the production of chromium oxide on the cut surface, which resulted in the production of a good-quality cut surface. This could only mean that the oxygen part of the gas would continue on, through the kerf, to exit at the other end, thus resulting in the claimed predominantly oxidizing atmosphere at the region defined by the bottom surface and the kerf as well as the claimed predominantly reducing atmosphere through the kerf, provided by the hydrogen shielding gas (present claim 1). As there was no mention in D6' of bottom dross, it meant there was no bottom dross produced, which could only mean that the reducing hydrogen gas had been used up in the kerf (present claim 8). Thus, if the subject-matter of claim 8 as granted did not involve inventive step over the combination of teachings of D3 and D6', the same should apply to the subject-matter of present claims 1 and 8.

Reasons for the Decision

1. Admissibility of the appeal

According to the Respondent the Appellant was not adversely affected (Article 107 EPC) by the decision under appeal as it had accepted the Opposition

Division's reasoning against claim 8 as granted by not contesting the decision on this point. In not providing any reasons why the decision was wrong it had not supplied the grounds of appeal as required by Article 108 EPC. It further should have supplied reasons why claims 1 and 11 as granted were allowable.

- 1.1 Pursuant to Rule 65 EPC in conjunction with Article 107 EPC an appeal can only be filed by a party adversely affected by the decision under appeal. That is the case with the present decision under appeal, which did not accede to the single request of the Appellant, being rejection of the opposition.

It has to be borne in mind that the admissibility of an appeal under Rule 65 EPC in conjunction with Article 107 EPC is determined on the basis of a comparison of the request(s) of the Appellant in the first instance proceedings with the decision of the first instance, rather than by comparing the request filed in the subsequent appeal proceedings with the decision under appeal (see T 825/00, not foreseen for publication in the OJ EPO).

- 1.2 Under Rule 65 EPC in conjunction with Article 108 EPC the Appellant has to furnish a statement of grounds of appeal. According to the constant jurisprudence of the Boards of Appeal such a statement of grounds of appeal should contain the legal and factual reasons why the decision is to be set aside.

That condition is fulfilled in the present case, as the Appellant has furnished the necessary factual reasons (an amended set of claims no longer comprising claims 8

to 10 as granted which led to the revocation of the patent) as well as the legal reasons ("the revised main request therefore contains only subject-matter found by the Opposition Division to fulfill the requirements of the EPC with respect to novelty ... and inventive step...".) why the decision under appeal should be set aside.

- 1.3 Finally, the Board is unable to find support in the EPC for the Respondent's contention that in the present case the Appellant should have supplied, in its notice of appeal or its statement of grounds of appeal, reasons why the subject-matter of the other independent claims 1 and 11 as granted was novel and involves inventive step. This would amount to the requirement that an Appellant has to argue on points in the decision by which he has not been adversely affected, which would be contrary to Article 107 EPC.

In any case, the Appellant has referred, in its statement of grounds of appeal, to his revised main request containing only subject-matter found by the Opposition Division to fulfill the requirements of the EPC with respect to novelty and inventive step.

- 1.4 Considering that the other requirements for admissibility are also fulfilled, the appeal is admissible.

2. *Amendments*

The amendments to the patent concern the deletion of granted claims 8 to 10, which led to the decision under appeal revoking the patent, and the discussion in the

description of the prior art document D6, which the Board considered necessary for the purposes of Rule 27(1) (b) EPC.

These amendments meet the provisions of the EPC and are therefore not objectionable.

3. *Novelty (Article 54 EPC)*

Novelty of the subject-matter of present claims 1 and 8 was acknowledged by the decision under appeal and was not disputed by the Respondent; the Board has ascertained that none of the documents available in the file discloses all features of each of these claims.

4. *Inventive step (Article 56 EPC) - claim 1*

4.1 Closest prior art for the discussion of inventive step of the subject-matter of claim 1 is constituted by D6 (the references are to the English translation D6'), which discloses a metal cutting process for use with a cutting torch for producing a kerf in a stainless steel (page 5, first paragraph) workpiece (4) that has an upper surface adjacent the cutting torch and a bottom surface opposite the torch, where the torch uses a total gas flow to the kerf, the total gas flow comprising a reducing gas (hydrogen) and an oxidizing gas (oxygen), in which process the formation of chromium oxide on the cut surface is prevented (page 5, first paragraph).

Of this known process it is not disclosed which amount of the total gas flow should consist of hydrogen. It should be sufficient to produce a sheeny cut surface,

by inhibiting oxidation of the cut surface by the oxygen present in the total gas flow and to concentrate the oxygen gas flow, so as to maintain dross-blow-out force.

For carrying out the teaching of D6', it can be expected of the skilled person to determine the proper amount of hydrogen by increasing in steps the amount of hydrogen in respect of the total gas flow, until he has achieved a sheeny cut surface combined with no adherent dross.

- 4.2 However, such a process is not adapted to cut different sheet thicknesses while maintaining this sheeny cut surface and no bottom dross (see patent in suit, column 1, lines 28 to 39).

The processes according to present claims 1 and 8 solve **that problem** by controlling the ratio of the reducing gas flow to the total gas flow based on the thickness of the sheet.

This solution is, however, known from D3, which relates to plasma arc cutting of stainless steel (see e.g. page 7, Table IV), using hydrogen in the total gas flow to inhibit or reduce the formation of oxides on the cut surface (see D3, page 5, point 2.3, penultimate paragraph). It is further proposed in D3 to increase the amount of hydrogen in respect of the total gas flow when the thickness of the material to be cut is increased (see D3, page 6, point 3.2.2). The thicker the sheet, the more heat is necessary, thus in such a case the skilled person will increase the amount of hydrogen initially determined. For thinner sheets,

naturally, the skilled person will reduce the amount of hydrogen in respect of the total gas flow.

Increasing the ratio of reducing gas to total gas flow when increasing the thickness of the material to be cut thus - on its own - would not involve inventive step, as has correctly been argued by the Opposition Division in respect of the subject-matter of claim 8 as granted.

4.3 However, there remains the **further** problem of optimizing the amount of hydrogen used in the total gas flow, because the Board considers that the skilled person, when applying the teaching of D3 to the process he has learnt from D6', will not without reason start an iterative trial process so as to determine the **lowest possible amount** of hydrogen which does the job.

He will merely choose a higher amount of hydrogen for sheets thicker than his reference sheet (or a lower amount for thinner sheets) and see whether the cut surface is still sheeny and without bottom dross. If that is the case that gas ratio is used for that thickness of sheet and he will not consider further trials.

If the cut surface is no longer sheeny, the indications in D3 and D6' are that the amount of hydrogen should be increased.

However, if bottom dross is formed, the available prior art does not provide him with direct indications as to what he has to do. According to D6' a further **increase** in hydrogen would be the solution, as it would further help in concentrating the oxygen flow, which is

discussed as necessary for blowing off the bottom dross (page 3, left column, line 30 - right column, line 5). According to D2 (page 37, left column, third paragraph) a too large amount of **hydrogen** in a combination with **argon** could result in the formation of bottom dross, when cutting **aluminum alloy**, as the lighter hydrogen replaced the heavier argon, thus reduced the momentum of the gas. This would induce the skilled person to **reduce** the amount of hydrogen.

- 4.4 Even if the skilled person would consider the latter to be directly applicable to **hydrogen-oxygen** cutting of **stainless steel** sheets as taught by D6', he would still have contradictory teachings as to what to do in such a case: increase or decrease the amount of hydrogen.

The Board therefore considers that there is no direct indication for the skilled person to determine the least possible amount of hydrogen to be used with respect to the total gas flow, when cutting different sheet thicknesses, let alone to choose the solution presented by the processes according to present claims 1 and 8:

- In the process of present claim 1 the amount of reducing gas in respect of the total gas flow is determined such that there is a predominantly reducing gas atmosphere through the kerf and a predominantly oxidizing atmosphere generally at the region defined by the bottom surface and the kerf.
- In the process of present claim 8 the amount of reducing gas is determined such that it is

consumed in the kerf during cutting leaving a negligible concentration of the reducing gas at the bottom surface.

4.5 In view of the above the Respondent's contention that mere application of the teaching of D3 in the process known from D6', combined with the wish to maintain a sheeny cut surface and no bottom dross, cannot hold either.

4.6 Consequently the Board finds that the subject-matter of claims 1 and 8 involve inventive step.

The subject-matter of dependent claims 2 to 7 and 9 to 11 being for preferred embodiments of the processes claimed in claims 1 and 8 respectively (Rule 29(3) EPC) thus also fulfil the requirements as to novelty and inventive step.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent on the basis of the following documents:
 - claims 1 to 11

 - description, columns 1 to 8 and page 2a

 - figures 1 to 4, all filed in the oral proceedings.

The Registrar:

The Chairman:

M. H. A. Patin

P. Alting van Geusau