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Datasheet for the decision of 30 August 2016

Case Number: T 0169/11 - 3.2.06

Application Number: 04000826.0

Publication Number: 1439021

IPC: B23K9/10

Language of the proceedings: EN

Title of invention:
Electric arc welding system

Patent Proprietor:
Lincoln Global, Inc.

Opponent:
Esab AB

Headword:

Relevant legal provisions:
RPBA Art. 13(1)
EPC 1973 Art. 83, 56, 84
EPC Art. 123(2)

Keyword:
Inventive step - (yes)
Late-filed document - admitted (yes)

Decisions cited:

Catchword:

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Case Number: T 0169/11 - 3.2.06

D E C I S I O N
of Technical Board of Appeal 3.2.06
of 30 August 2016

Appellant: (Patent Proprietor)	Lincoln Global, Inc. 1200 Monterey Pass Road Monterey Park, California 91754 (US)
Representative:	Grosse Schumacher Knauer von Hirschhausen Patent- und Rechtsanwälte Frühlingstrasse 43A 45133 Essen (DE)
Appellant: (Opponent)	Esab AB Box 8004 402 77 Göteborg (SE)
Representative:	Awapatent AB P.O. Box 11394 404 28 Göteborg (SE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 19 November 2010 concerning maintenance of the European Patent No. 1439021 in amended form.**

Composition of the Board:

Chairman	T. Rosenblatt
Members:	M. Hannam
	P. Schmitz

Summary of Facts and Submissions

I. An appeal was filed by the appellant (opponent) against the interlocutory decision of the opposition division in which it found that European patent No. 1 439 021 in an amended form met the requirements of the EPC. The appellant (opponent) requested that the decision be set aside and the patent be revoked.

II. In support of its request the following documents relevant to the present decision were cited by the opponent:

D4 US-A-6 472 634
D5 EP-A-1 023 965
D11 ESAB product description, July 1999
D22 EP-A-1 249 297

III. An appeal against this interlocutory decision was also filed by the appellant (proprietor). It requested that the decision be set aside and the patent be maintained according to a main request or, in the alternative, that the patent be maintained according to one of auxiliary requests 1 to 6 filed with letter of 29 March 2011.

IV. With letter of 15 April 2015 the opponent submitted a further document:

D27 US-B-6 177 651

V. With letters of 14 April 2015 and 21 April 2016 the proprietor submitted further auxiliary requests. The auxiliary requests consequently on file were auxiliary request 1, 1a, 1b, 2, 3, 3a and 4 to 7.

VI. Oral proceedings were held before the Board on 30 August 2016, during which the proprietor withdrew all requests save for auxiliary request 6, which had originally been filed with letter of 29 March 2011 as auxiliary request 5.
The final requests of the parties were:
- of the opponent, that the decision under appeal be set aside and the patent be revoked; and
- of the proprietor, that the decision under appeal be set aside and the patent be maintained on the basis of
  - claim 1 of auxiliary request 6, filed as auxiliary request 5 with letter of 29 March 2011,
  - claims 2 to 21 filed during the oral proceedings before the Board.

VII. Claim 1 of auxiliary request 6 reads as follows:
"An electric arc welding system comprising a first and second power supply for creating a first AC welding arc with a first current waveform between a first electrode and a workpiece by said first power supply and a second AC welding arc with a second current waveform between a second electrode and a workpiece by said second power supply as said first and second electrodes are moved in unison along a welding path, said first and second power supply each comprising an high speed switching inverter creating its waveform by a number of current pulses occurring at a frequency of at least 18 kHz with the magnitude of each current pulse controlled by a wave shaper and the polarity of said waveforms controlled by a logic signal, wherein the electric arc welding system further comprises a system adapted to control the relationship between the AC currents of adjacent tandem electrodes to phase shift the first AC waveform from said second AC waveform,
characterized in that
the system adapted to control the relationship between

the AC currents of adjacent tandem electrodes to phase shift the first AC waveform from said second AC waveform is also adapted to limit the time of concurrent polarity relationships such as like polarity and opposite polarity, wherein at least said first AC waveform has one, positive or negative, polarity portion of substantially less energy than its opposite polarity portion, wherein said first waveform has a positive portion generally synchronised with and correlated to the positive and negative portions of one of said second waveforms and a negative portion generally synchronised with and correlated to the positive and negative portion of the next second waveform following said one of said second waveforms."

VIII. The proprietor's arguments relevant to the present decision may be summarised as follows:
The requirement of Article 83 EPC was met by the present request. It was not necessary for the patent specification to disclose in detail every claim permutation, rather solely for the skilled person to be able to carry out the claimed invention. The skilled person would realise the claimed requirement of providing one waveform polarity portion having substantially less energy than the other through altering the amplitude of the waveform.
Claim 1 met the requirement of Article 123(2) EPC, having basis in a combination of claims 1 and 22 as granted.
The subject-matter of claim 1 involved an inventive step (Article 56 EPC). Starting from D4 and wishing to solve the problem of achieving improved control of weld deposition and penetration, the skilled person would find no hint to the claimed solution in the cited art. A very specific embodiment of the invention was claimed which would not be reached in an obvious manner without

the benefit of hindsight. D27 should not be admitted into the proceedings since it was late filed and not more relevant than those documents already on file. The case should be remitted to the first instance firstly, as it was not possible to discuss the full complexity of D27 at this late stage and secondly, to allow the parties to have this issue decided upon before two instances. Failing that the present oral proceedings should be postponed to a later date.

IX. The opponent's arguments relevant to the decision may be summarised as follows:

The subject-matter of claim 1 could not be carried out by the person skilled in the art. Firstly there was no disclosure in the patent of how the weld pool can be controlled. Secondly there was no disclosure of how to synchronise the first and second waveforms whilst providing one waveform with a first polarity of substantially less energy than its opposite polarity; this could not be achieved as evident when trying to synchronise the two waveforms and concurrently adjust the time length of the positive and negative portions of one of the waveforms. The figures of the patent also failed to depict the two claimed waveforms with all features as defined in claim 1.

D27 should be admitted into the proceedings as it was *prima facie* very relevant for an inventive step attack when starting from D4, disclosing dual electrodes and the varying of the phase between the electrodes and the balance of a single electrode (see D27 col. 3, lines 8 to 13 and 59 to 62). The proprietor had had over a year to prepare its defence to this attack such that neither remittal to the first instance nor postponement of the proceedings was appropriate.

The subject-matter of claim 1 lacked an inventive step (Article 56 EPC). D4 disclosed a first polarity portion

having substantially less energy than its opposite polarity portion through the explicit reference to D5 in col. 1, lines 48 to 49. Starting from D4, this document implicitly disclosed (col. 4, from line 35; col. 9, lines 9 to 13) providing a second waveform with twice the frequency of the first waveform since for synchronisation of the waveforms to be present, both waveforms either had to exhibit the same frequency or the frequency of the second waveform had to be a multiple of that of the first waveform. The objective technical problem to be solved could thus be seen as 'to provide a welding system capable of controlling the penetration and deposition'. An obvious solution to this was provided by D5, D11, D22 or D27 which each disclosed adjusting the power balance of at least the first waveform.

Reasons for the Decision

1. Procedural matters

1.1 Admittance of D27

D27 was filed after the opponent had submitted its complete case (Article 12(2) Rules of Procedure of the Boards of Appeal, RPBA) and therefore its admittance is at the discretion of the Board (Article 13(1) RPBA).

The admittance of this document as well as the successive requests of remittal of the case and postponement of the oral proceedings (see below) were discussed with the parties and decided upon by the Board in the context of the subsequently withdrawn main request.

In the present case the Board admitted D27 as it *prima facie* appeared very relevant in combination with D4 when considering the presence of an inventive step in the subject-matter of claim 1 of the then pending main request. D27 discloses a dual electrode welding system (see col. 4, lines 14 to 22) in combination with a waveform in which one polarity portion has substantially less energy than its opposite polarity portion (see col. 3, lines 59 to 62). The other documents on file used by the opponent for combination with D4 in its inventive step arguments are only single electrode welding systems, such that D27 indeed appeared more relevant.

The Board thus exercised its discretion under Article 13(1) RPBA in admitting D27 to the proceedings.

1.2 Remittal to the department of first instance (Article 111(1) EPC)

1.2.1 The proprietor's suggestion that, having admitted D27, the case should be remitted to the first instance for further prosecution is not accepted. In this respect of importance is that the admittance of the document did not fundamentally change the objection to inventive step already on file; the starting document remained D4 and the objective technical problem remained unchanged. Furthermore, the proprietor had had more than one year to prepare its response to the newly filed document such that the suggestion that the document is too complex to discuss was not persuasive.

1.2.2 The proprietor's argument that the parties had a right to have the issue heard before two instances was also not persuasive. In fact, no such 'right' exists, the decision to remit the case being at the discretion of

the Board as indicated in Article 111(1) EPC, second sentence. In the present case, as indicated in point 1.2.1, the Board saw no convincing reason to remit the case, with the inventive step objection remaining essentially unchanged and the proprietor having had adequate time to prepare its response.

1.2.3 The Board thus rejected the request to remit the case to the department of first instance.

1.3 Postponement of the oral proceedings

As found in point 1.2 above, the admittance of D27 did not fundamentally change the inventive step objection already on file. As a consequence no significant change of case has resulted from its admittance and the opponent had had over one year to prepare its response to the arguments based on this new document. The proprietor could thus reasonably be expected to deal with the issues raised through admittance of D27.

The Board thus rejected the request to postpone the oral proceedings.

2. Auxiliary request 6

2.1 Article 123(2) EPC, Article 84 EPC 1973

Claim 1 comprises a combination of claims 1 and 22 as granted. The opponent raised no objections under Articles 84 or 123(2) EPC to the subject-matter of claim 1. The Board also sees no objections in this regard.

2.2 Article 83 EPC 1973

The invention according to claim 1 is disclosed in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

2.2.1 It was accepted by the parties that a waveform exhibiting substantially less energy in one polarity portion relative to its opposite polarity portion could be realised in at least two different ways, as shown also in Figures 7 and 8 of the patent:
- by providing different wave amplitudes in each of the opposite polarity portions; or
- by providing different time lengths for the positive and negative portions of the wave.

2.2.2 The inability of the skilled person to carry out the invention, as alleged by the opponent, resided in the variation in energy between the positive and negative wave portions being realised through the second of these options, i.e. through providing different time lengths for the positive and negative wave portions; this would produce an irregular period for the half waves such that the first waveform could then not be synchronised with the second waveform, as required by claim 1.

2.2.3 It is noted that the skilled person is not limited to this second option for realising the energy variation between the two wave portions. Indeed, through selecting the first option, whereby the wave amplitudes are different in the respective opposite polarity portions, no inability of synchronising the two waveforms results. This was also not contested by the opponent.

2.2.4 The Board holds that the skilled person understands the ways in which the energy variation between the positive

and negative wave portions can be realised and, when attempting to carry out the invention according to claim 1, would select that way of varying the energy which also clearly enabled synchronisation of the two waveforms. The alternative way of varying the energy of the first waveform would be disregarded by the skilled person due to his immediate recognition that providing different time lengths for the positive and negative wave portions could interfere with the claimed requirement for synchronisation of the first and second waveforms.

2.2.5 The opponent's contention that neither the figures nor any embodiment of the patent specification detailed the welding system of claim 1 is also not prejudicial to Article 83 EPC. There is no requirement for the disclosure of a detailed embodiment in order for the skilled person to be able to carry out the invention; of importance is that, based on the disclosure in the patent as a whole, the skilled person is able to do so. As indicated in points 2.2.3 to 2.2.4 above, this requirement is evidently met.

2.2.6 As regards the opponent's further objection, made only in writing and specifically with respect to the patent as granted, that the patent failed to disclose how the weld pool can be controlled, this is not found to hinder the skilled person from carrying out the invention. In its preliminary opinion the Board indicated that the invention as defined in the subject-matter of claim 1 of the patent as granted was not directed to controlling of the weld puddle and that there thus appeared no need for an enabling disclosure of how such control is achieved. Whilst this objection would also apply to claim 1 of the present request, the opponent declined to submit any further arguments in

this respect after having received the preliminary opinion. The Board thus sees no reason to change its opinion in this respect.

2.2.7 The Board thus finds that claim 1 meets the requirement of Article 83 EPC 1973.

2.3 Article 56 EPC 1973

The subject-matter of claim 1 involves an inventive step.

2.3.1 Starting from D4, which is accepted by the parties as the most promising starting point for an inventive step attack, this document discloses the following features of claim 1 (the references in brackets referring to D4):
- an electric arc welding system (S; Figs. 1, 5, 5A)
- comprising a first and second power supply (PSC, PSD)
- for creating a first AC welding arc with a first current waveform (424) between a first electrode (352) and a workpiece by said first power supply (PSC) and a second AC welding arc with a second current waveform (426) between a second electrode (354) and a workpiece by said second power supply (PSD)
- as said first and second electrodes are moved in unison along a welding path (col. 8, lines 29 to 31),
- said first and second power supply each comprising an high speed switching inverter (col. 7, lines 27 to 30, 47 to 50) creating its waveform by a number of current pulses occurring at a frequency of at least 18 kHz (implicitly the case in such welding systems, see also col. 9, line 54 to 55) with the magnitude of each current pulse controlled by a wave shaper and the polarity of said waveforms (424, 426) controlled by a logic signal col. 7, lines 47 to 50),

- wherein the electric arc welding system further comprises a system adapted to control the relationship between the AC currents of adjacent tandem electrodes to phase shift (col. 8, lines 29 to 38) the first AC waveform (424) from said second AC waveform (426),
- and also adapted to limit the time of concurrent polarity relationships such as like polarity and opposite polarity (inherently the case for waveforms phase shifted one relative to the other).

2.3.2 With respect to the previously pending main request, the opponent had argued that, through the explicit reference to the switching concept of D5 in col. 4, lines 47 to 48 of D4, the feature of claim 1 regarding a first polarity portion having substantially less energy than its opposite polarity portion was known. Although this argument was not explicitly repeated in regard to the present request, it would apply similarly so that, for the sake of completeness, it is considered here. The argument was however not convincing since D5 discloses a number of different switching concepts (see Figs. 4 to 7), only Fig. 7 of which incorporates different energy between the different polarity portions of a single waveform. There is in D4 no unambiguous reference to any particular switching concept of D5, such that the feature of the first AC waveform having one, positive or negative, polarity portion of substantially less energy than its opposite polarity portion can not be seen as directly and unambiguously disclosed in D4.

2.3.3 D4 thus fails to disclose that:
1. at least said first AC waveform has one, positive or negative, polarity portion of substantially less energy than its opposite polarity portion, and
2. said first waveform has a positive portion generally

synchronised with and correlated to the positive and negative portions of one of said second waveforms and a negative portion generally synchronised with and correlated to the positive and negative portion of the next second waveform following said one of said second waveforms.

2.3.4 According to para. [0011] of the patent, the first differentiating feature above affects the trade-off between penetration and deposition caused by the positive and negative portions of the waveform. The second differentiating feature above, however, is not explicitly credited with a particular technical effect in the patent. Nonetheless, interpreting the feature indicates that the second waveform must have a frequency at least twice that of the first waveform, such that this second differentiating feature implicitly promotes the limitation of the time of concurrent polarity relationships between the waveforms. Para. [0009] of the patent indicates that limiting the time of concurrent polarity relationships assists the control of the weld pool. The objective technical problem to be solved when starting from D4 may thus be seen as enabling the control of penetration and deposition whilst maintaining a quiescent weld pool.

The opponent's suggestion that the objective problem concerned only 'providing a welding system enabling the control of penetration and deposition' ignores the technical effect of the second differentiating feature of claim 1 over D4. Whilst it is accepted that the avoidance of an unstable weld pool was recognised as desirable by the skilled person even before the priority date of the present patent, the provision of the second waveform with a frequency at least twice that of the first waveform further limits the time of

concurrent polarity relationships between the waveforms with the consequence, as described in para. [0009] of the patent, of limiting collapse and repulsion of the weld pool. The maintenance of a quiescent weld pool is thus seen as a part of the objective technical problem to be solved.

2.3.5 Starting from the welding system known from D4 and wishing to solve the above objective technical problem, the skilled person would not reach the claimed subject-matter without exercising an inventive step. Whilst each of D5, D11, D22 and D27 discloses a first waveform with one polarity portion of substantially less energy than its opposite polarity portion (see D5, Fig. 7; para. 5.7.2.2 of D11; D22, col. 13, lines 32 to 35; D27, col. 3, lines 59 to 64), no hint is to be found suggesting incorporating the second differentiating feature into the known welding system i.e. that the first waveform has a positive portion generally synchronised with and correlated to the positive and negative portions of one of said second waveforms and a negative portion generally synchronised with and correlated to the positive and negative portion of the next second waveform following said one of said second waveforms.

2.3.6 The opponent's argument, that for the first and second waveforms to be synchronous the waveforms had either to have the same frequency or to have a common frequency factor, was not persuasive in rendering the claimed solution obvious. As regards D5, D11 and D22 for combination with D4, each includes just a single electric arc, such that no frequency relationship between two arcs is suggested in these. Even in D27, which discloses dual arc welding systems, there is no suggestion of concurrently providing different

frequency outputs for the two electric arcs. Providing such a relative frequency relationship is also not considered to be obvious to the skilled person, particularly with neither a hint for doing so nor a suggestion that it may be advantageous in a multiple arc welding system. The provision of the second waveform with a frequency at least twice that of the first waveform is thus not considered obvious to the skilled person when starting from D4.

2.3.7 The subject-matter of claim 1 is thus considered to involve an inventive step in view of the available prior art (Article 56 EPC 1973).

2.3.8 Claims 2 to 21 filed at the oral proceedings as claims dependent on claim 1 met with no objections from the opponent. The Board also sees no objections to these claims.

2.3.9 Thus the claims of the patent and the invention to which they relate meet the requirements of the Convention (Article 101(3)(a) EPC). However, the patent description and figures to the amended set of claims according to auxiliary request 6 have not yet been adapted, this being entrusted to the department of first instance.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent on the basis of the following documents:
   - Claim 1 of auxiliary request 6, filed as auxiliary request 5 with letter of 29 March 2011,
   - Claims 2 to 21 filed during the oral proceedings before the Board,
   - Description and Figures to be adapted thereto.

The Registrar: The Chairman:

M. H. A. Patin T. Rosenblatt

Decision electronically authenticated