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Datasheet for the decision of 8 August 2013

Case Number: T 0744/10 - 3.2.06

Application Number: 97201482.3

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IPC: B23K26/12, B29C65/06

Language of the proceedings: EN

Title of invention:
Friction stir welding with simultaneous cooling

Patent Proprietor:
The Boeing Company

Opponent:
Airbus SAS

Headword:

Relevant legal provisions:
EPC Art. 111(2), 56, 84, 123(2)
RPBA Art. 13(1)

Keyword:
Decision against ratio decidendi - addition of independent claim (no)Inventive step - main request (no)
Added subject-matter - auxiliary requests 1, 5 (yes)
Late-filed auxiliary requests - admitted (no)

Decisions cited:

Catchword:

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Case Number: T 0744/10 - 3.2.06

D E C I S I O N
of Technical Board of Appeal 3.2.06
of 8 August 2013

Appellant: (Patent Proprietor)	The Boeing Company 100 North Riverside Plaza Chicago, IL 60606-2016 (US)
Representative:	Land, Addick Adrianus Gosling Arnold & Siedsma Sweelinckplein 1 2517 GK Den Haag (NL)
Respondent: (Opponent)	Airbus SAS 1 Rond-Point Maurice Bellonte 31700 Blagnac (FR)
Representative:	Santarelli 14 Avenue de la Grande Armée B.P. 237 75822 Paris Cedex 17 (FR)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 12 February 2010 concerning maintenance of the European Patent No. 810056 in amended form.**

Composition of the Board:

Chairman: K. Garnett
Members: T. Rosenblatt
G. Kadner

Summary of Facts and Submissions

I. European patent No. 0 810 056 was granted with a set of claims comprising four independent claims: independent claim 1 relates to a method of friction stir welding, independent claims 7 and 11 relate to two embodiments of a friction stir welding tool and independent claim 9 to a friction stir welding apparatus.

II. An opposition was filed against the patent and in a first interlocutory decision the opposition division found that the patent as amended during the opposition proceedings met the requirements of the EPC.

III. The patent proprietor and the opponent appealed against this decision. By its decision T 1556/06 the Board of Appeal 3.2.06, in a different composition as in the present case, set aside the interlocutory decision and remitted the case to the opposition division for further prosecution, based on an auxiliary request comprising three claims. The independent claims 1 and 3 thereof corresponded to the granted independent claims 7 and 11, respectively.

IV. In the course of the continued opposition proceedings the patent proprietor submitted a main request and first to third auxiliary requests.

The main, first and second auxiliary requests included in addition to the three claims remitted to the opposition division, which remain unchanged, an additional independent claim 4. The third auxiliary request comprised only the three remitted claims.

V. In its second interlocutory decision, which was posted on 12 February 2010, the opposition division decided

that the patent in the amended form according to the third auxiliary request met the requirements of the EPC.

VI. The present appeal concerns this second interlocutory decision of the opposition division. With a letter of 8 April 2010 the appellant (patent proprietor) filed the notice of appeal and simultaneously paid the prescribed fee. The grounds of appeal were submitted with a letter of 11 June 2010. The appellant requested that the decision be set aside and the patent be maintained on the basis of the main request or the first or second auxiliary requests, all as underlying the second interlocutory decision.

VII. The respondent (opponent) replied by letter dated 26 October 2010 *inter alia* requesting dismissal of the appeal.

VIII. In a communication dated 13 June 2013, sent in preparation for oral proceedings, the Board informed the parties that the addition of a further independent claim to the remitted claims did not appear to go against the ratio decidendi of the earlier decision T 1556/06, that the subject-matter of the added claim 4 of the main request did not however appear to involve an inventive step, that the auxiliary requests I and II seemingly contravened the requirements of Articles 56, 84 and 123(2) EPC and in any event did not appear to alter the Board's preliminary conclusion on inventive step as regards claim 1.

IX. In its letter dated 18 July 2013 the appellant filed a main request and auxiliary requests I to XIII.

X. In its letter dated 1 August 2013 the respondent stated that it would not be attending the oral proceedings fixed for 8 August 2013 and that, in the event of the Board admitting any of the appellant's auxiliary requests II to IV or VI to XII into the proceedings, it be given the opportunity to respond to these requests and also that a different order for costs be made.

XI. Oral proceedings were held on 8 August 2013 in the absence of the respondent. During the oral proceedings the appellant submitted additional auxiliary requests IV' and IX' and withdrew auxiliary request XIII.

XII. At the end of the oral proceedings, the appellant requested that the decision under appeal be set aside and the patent be maintained on the basis of the main request, alternatively on the basis of auxiliary requests I to IV, all as filed with the letter dated 18 July 2013, alternatively on the basis of auxiliary request IV' as filed during the oral proceedings, alternatively on the basis of auxiliary requests V to IX as filed with the letter dated 18 July 2013, alternatively on the basis of auxiliary request IX' as filed during the oral proceedings, alternatively on the basis of auxiliary requests X to XII as filed with the letter dated 18 July 2013.

XIII. In all requests claims 1 to 3 are the same as the corresponding claims 1 to 3 upon which the remittal was based in the Board's first decision T 1556/06, and which in its second decision the opposition division held to be allowable (constituting the appellant's then third auxiliary request).

The current **main request** is the same as the main request filed with the grounds of appeal and as that

which was refused by the opposition division. Independent claim 4 of the request has the following wording:

"4. A friction stir welding apparatus comprising:
(a) a friction stir welding tool (30) comprising a tool body having a pin (40) and shoulder (38) at a distal end, the pin and shoulder generating frictional heat when rotating in contact with parts to be welded together, the heat causing a weld to form between the parts; characterized by
(b) a coolant distribution device (50), in fluid communication with a source of coolant, the device aligned to direct coolant around the distal end of the tool body, when the tool is used to weld."

Claim 4 of auxiliary requests I - XII comprises the following amendments (emphasis added by the Board).

Auxiliary request **I** is the same as auxiliary request I filed with the grounds of appeal and as auxiliary request I refused by the opposition division. Claim 4, compared to claim 4 of the main request, reads:

"*4. A friction stir welding apparatus comprising:*
(a) a friction stir welding tool (30) comprising a tool body having a pin (40) and shoulder (38) at a distal end (36), the pin and shoulder generating frictional heat when rotating in contact with parts (20) to be welded together, the heat causing a weld to form between the parts;
characterized by:
(b) a coolant distribution device (50), in fluid communication with a source of coolant, the device aligned to direct coolant around the distal end of the tool body, when the tool is used to weld, and to remove

excess heat from the exposed portion of the shoulder that is above the parts during welding, from the workpiece itself, and from the weld that is being formed; wherein the apparatus is adapted to control the amount of coolant to reduce the degree of adherence between the tool and the softened material to smoothen the weld surface; and to avoid removal of so much heat as to interfere with the welding operation."

Auxiliary request **II**, filed with the letter of 18 July 2013, was new. Claim 4 reads:

"4. *A method for operating a friction stir welding apparatus for welding a workpiece, said friction stir welding apparatus comprising:*
(a) a friction stir welding tool (30) comprising a tool body having a pin (40) and shoulder (38) at a distal end (36), the pin and shoulder generating frictional heat when rotating in contact with parts (20) to be welded together, the heat causing a weld to form between the parts; characterized by
(b) a coolant distribution device (50), in fluid communication with a source of coolant, the device aligned to direct coolant around the distal end of the tool body, when the tool is used to weld;
said method comprising:
operating the coolant distribution device during welding so that excess heat is removed from the exposed portion of the shoulder that is above the parts during welding, from the workpiece itself, and from the weld that is being formed;
and controlling the amount of coolant to reduce the degree of adherence between the tool and the softened material to smoothen the weld surface; and to avoid removal of so much heat as to interfere with the welding operation."

Auxiliary request **III**, filed with the letter of 18 July 2013, was new. Compared to auxiliary request II, the features in claim 4 following on from the expression "*said method comprising*" have been amended to read:

"*operating the coolant distribution device during welding so that the coolant removes excess heat from both the exposed portion of the shoulder that is above the workpiece during welding, the workpiece itself, and the weld that is being formed;*
and controlling the amount of coolant for removing excess heat to provide a smoother weld surface at a faster weld rate than would have been the case, but for the supply of coolant, whilst avoiding removal of so much heat as to interfere with the welding operation."

Auxiliary request **IV**, filed with the letter of 18 July 2013, was new. Claim 4 reads:

"*4. A friction stir welding apparatus comprising:*
(a) a friction stir welding tool (30) comprising a tool body having a pin (40) and shoulder (38) at a distal end (36), the pin and shoulder generating frictional heat when rotating in contact with parts (20) to be welded together, the heat causing a weld to form between the parts; characterized by
(b) a coolant distribution device (50), in fluid communication with a source of coolant, the device aligned to direct coolant around the distal end of the tool body, when the tool is used to weld; wherein the coolant distribution device is a nozzle able to produce a mist of coolant therethrough, which mist impinges directly on the distal end."

In auxiliary request **IV'**, filed during the oral proceedings before the Board, the last feature ", *which mist ... distal end*" of claim 4 of auxiliary IV is deleted.

Auxiliary request **V** corresponds to auxiliary request II as filed with the grounds of appeal and as refused by the opposition division. Compared to claim 4 of auxiliary request I, feature (b) of claim 4 of has been amended as follows:

"*(b) a nozzle (50) extending in proximity of the distal end of the tool body, in fluid communication with a source of coolant, the nozzle aligned to direct coolant around the distal end of the tool body, such that coolant exits the nozzle in a mist that impinges directly on the distal end (36) of the tool body and the surrounding parts (20), when the tool is used to weld, and to remove excess heat....*"

Auxiliary request **VI**, filed with the letter of 18 July 2013, was new. Compared to auxiliary request IV, feature (b) in claim 4 has been amended to read as follows:
"*..., the device aligned to direct coolant at the junction between the shoulder and the weld surface, on the side opposite the direction of welding, when the tool is used to weld;...*"

Auxiliary request **VII**, filed with the letter of 18 July 2013, was new. Compared to auxiliary request II, feature (b) of claim 4 has been amended to read as follows:

"*...when the tool is used to weld; wherein the coolant distribution device is a nozzle able to produce a mist of coolant therethrough, said method comprising*:
said method comprising: [sic]
impinging the mist directly on the distal end, and on the surrounding work piece, when the tool is used to weld, such that excess heat is removed from the exposed portion of the shoulder that is above the workpiece during welding, ~~from~~ the workpiece itself, and ~~from~~ the weld that is being formed; and controlling the amount of coolant for removing excess heat to provide a smoother weld surface at a faster weld rate than would have been the case, but for the supply of coolant, whilst avoiding removal of so much heat as to interfere with the welding operation."

Auxiliary request **VIII**, filed with the letter of 18 July 2013, was new. Feature (b) in claim 4 comprises in addition to the amendments in auxiliary request VII also the amendment introduced into auxiliary request VI.

Auxiliary request **IX**, filed with the letter of 18 July 2013, was new. Compared to auxiliary request IV, feature (b) in claim 4 has been amended to read as follows:

"*..., which mist impinges directly on the distal end; said coolant distribution device being adapted for producing a coolant rate of about 6.3 x 10^{-5} m^3/s.*"

Compared to auxiliary request IX, claim 4 of auxiliary request **IX'**, filed during the oral proceedings before the Board, has been amended by replacing the numbering of the features, "*(a)*" and "*(b)*", with a hyphen and by

the following modifications of the characterising portion:

"*- a source of coolant that is supplied under pressure; - a coolant distribution device (50), in fluid communication with the source of coolant that is supplied under pressure, the device aligned to direct coolant around the distal end of the tool body, when the tool is used to weld; wherein the coolant distribution device is a nozzle able to produce a mist of coolant therethrough, which mist impinges directly on the distal end of the tool and the surrounding workpiece; said coolant distribution device being adapted for producing a coolant rate of about 6.3 x 10^{-7} m^3/s.*"

Auxiliary request **X**, filed with the letter of 18 July 2013, was new. Compared to auxiliary request VII, the feature "*wherein a coolant rate of about 6.3 x 10^{-5} m^3/s is used*" has been added at the end of claim 4.

The amendment in auxiliary request **XI**, filed with the letter of 18 July 2013, was new and comprises the two amendments of auxiliary requests VI and IX.

Auxiliary request **XII**, filed with the letter of 18 July 2013, was new. Compared to auxiliary request X, feature (b) in claim 4 has been amended to read:

"*...impinging the mist directly on the distal end, and on the surrounding work piece, at the junction between the shoulder and the weld surface, on the side opposite the direction of welding, when the tool is used to weld,...*".

XIV. The arguments of the appellant, as far as relevant to the present decision may be summarised as follows:

a) The admittance of the requests submitted before the opposition division lay within the discretion of the opposition division which was exercised according to the right principles. Also the introduction of an independent apparatus claim in addition to the two independent claims directed to the tool was not contrary to the *ratio decidendi* of the decision T 1556/06. The Board in that decision had only decided on claims directed to a method of friction stir welding, rather than on an apparatus claim.

b) Main request - Article 56 EPC

It was not obvious to provide in a friction stir welding apparatus a coolant distribution device aligned to direct the coolant around the distal end of the tool body when the tool is used to weld. Commonly known cooling devices, such as those used in milling operations, would not be applied in a friction stir welding process because the heat management issues were different. During friction stir welding the tool body's distal end was in contact with the weld, so that the coolant would not only remove excess heat from the tool body but also from the weld zone. This would, in contrast to the provision of coolant in a milling operation, negatively affect the welding process. The argument used by the Board in T 1556/06 in relation to the method claims and which was based on the premise that in order to increase the welding rate the heat input to the workpiece would have to be increased, lead therefore to a

contradiction and could not be applied by analogy to the present apparatus claim. E7, which represented the closest prior art to the subject-matter of claim 4, recognised as a drawback of friction stir welding the comparatively low welding rates achieved. According to E7, the heat input and the welding rate in the friction stir welding process were determined by the shape, size and material of the tool.

c) Auxiliary request I - Article 123(2) EPC

The feature "*apparatus adapted to control...*" was disclosed in the application as filed, see page 3, lines 5-26, the description of the specific embodiment starting on page 7 and in particular page 8, lines 9-15. It was clear for the skilled person that the apparatus comprising a coolant distribution device as disclosed therein and shown in Figure 2 would inherently have structural features, like commonly known valves or pumps, which allowed the control of the coolant amount. In view of the tiny amounts which were required in order to not negatively affect the welding process it was clear that the skilled person would have understood from the description that the apparatus required corresponding structural features which excluded the possibility that an operator was performing the control. Moreover, an operator would always be required in order to perform the welding process with the claimed apparatus, but this would still require that the apparatus had the structural feature which allowed the control.

d) Auxiliary requests II - VI, IV', VI - IX, IX', X - XII: admittance, convergence

These requests were filed in view of the problems raised for the first time by the Board in its communication and during the oral proceedings. They should therefore be admitted into the proceedings. Also for procedural economy and fairness it would not have been reasonable to submit a large number of auxiliary requests before the opposition division. The requests did not introduce any new subject-matter which was unexpected or could not be dealt with.

e) Auxiliary requests II, III - Articles 123(2) EPC

Claim 9 as filed and the disclosure on pages 7 and 8 of the description of an apparatus and of the welding process using such apparatus as filed implicitly comprised a disclosure of a method of the operation of that apparatus.

f) Auxiliary requests IV, IV' - Article 56 EPC

The additional feature of the nozzle specified that the "coolant exit[ed] the nozzle in a mist" which provided the necessary fine control so that the quality of the weld would not be compromised. The prior art did not contain any indication to use a mist of coolant to solve the problem of the invention, in particular by alleviating the adherence problem, and, moreover, taught away from the invention in that it only suggested cooling by liquid or gas (such as in E3). The dramatic increase of welding rate achieved by using the small amounts of coolant were demonstrated in the

description. Furthermore, it was contested that cooling by a mist would belong to the general knowledge of the skilled person.

g) Auxiliary request V - Article 123(2) EPC

The additional feature "nozzle" contributed to the controlling of the amount of coolant, so that the claim now clearly defined the structural means of "an apparatus adapted to control the amount of coolant" as was disclosed in the description, for example in the embodiment described on pages 7/8 and in Figure 2. When a mist was used for cooling the required small amounts could only be obtained by a control through the apparatus itself rather than by the operator of the apparatus.

h) Auxiliary request VI - Articles 123(2), 84, 56 EPC

The added feature was based on page 11, lines 15-20 and Figures 6B and 2. It was clear to the skilled person that the direction of welding was a feature of the apparatus itself since the welding would always be performed in a given direction with a given apparatus. The feature was clear and concise for the skilled person.

By cooling the hot side of the weld, material adherence to the tool's shoulder was further limited.

i) Auxiliary request VII - Article 123(2) EPC

The claimed method, supported in the application as filed by claims 9 and 10 and by page 7, line 32 to page 8, line 14, now specified the use of a

nozzle and coolant mist thereby addressing the Board's objections against auxiliary request V.

j) Auxiliary request VIII - Article 123(2) EPC

The amendment was supported on page 11, lines 15 to 20 and in Figure 2. The same arguments as with respect to auxiliary requests VI and VII applied.

k) Auxiliary requests IX, IX'- Article 56 EPC

The specified coolant rate, supported by page 8, line 15, for direct cooling of the weld in this range was not known from the prior art. E4 specified a coolant rate of 2 l/s, which was not to be compared with the low rate according to claim 4. This contributed to the solution of the problem allowing to minimize material adherence to the tool. The feature was counter-intuitive since normally one would slow the welding rate to prevent accumulation of adhering material, whereas the invention allows to maintain the welding rate by applying a mist at a small rate.

l) Auxiliary request X

The same arguments as with respect to auxiliary requests VII applied.

m) Auxiliary requests XI, XII

These requests corresponded to combinations of features of auxiliary requests VI and IX, and request VIII and X, so that the arguments provided for those requests also applied.

XV. The arguments of the respondent as presented in writing may be summarised as follows:

a) Point 4.4.3 of the reasons of the decision T 1556/06 limited the power of the opposition division to the examination of only inventive activity of claims 1 to 3 of the auxiliary request VII presented to the Board. The opposition division was bound by the reasons and the order of that decision and was therefore wrong to consider admissible the main request and auxiliary requests I and V (the latter originally submitted as second auxiliary request in the present appeal). The opposition division further should not have admitted these late filed requests having regard to the Rules of Procedure of the Boards of Appeal and for reasons of equity and procedural efficiency. The Board should thus dismiss the appeal for the reason that the requests filed before the opposition division should never have been admitted.

b) Main request - Article 56 EPC

The skilled person was aware that overheating occurred at the place of friction, i.e. at the distal end of the tool and it was self-evident to cool the tool at that place.

c) Auxiliary request I

The conclusions of the appellant drawn from the single value of the rate of coolant mentioned in the description were unreasonable.

d) Auxiliary request V

The fact that the coolant fluid was a mist did not change the reasoning presented with respect to auxiliary request I.

e) Auxiliary requests II-IV, VI-XII

These requests were presented for the first time only days before the date of the oral proceedings. At least for this reason they were inadmissible because nothing could justify their late introduction into the proceedings.

Auxiliary requests II and III constituted a major modification of the subject-matter from an apparatus claim to a method claim. The mix of structural and method features rendered the category of the claim unclear (Article 84 EPC). The remittal following the decision in T 1556/10 was based on apparatus claims and not on method claims, so that claim 4 of these requests was also contrary to the decision T 1556/06.

Reasons for the Decision

1. The appeal is admissible.

2. Since the appeal must be dismissed for the reasons given below it is not necessary to reach any conclusions on the respondent's arguments summarised in point XV (a), above.

Main request

3. Article 56 EPC

3.1 Starting from the friction stir welding apparatus disclosed in E7 (see for example Figures 1 and 2) as closest prior art, with regard to the distinguishing feature in the characterising portion of claim 4 of this request, the objective technical problem may be seen in providing a friction stir welding apparatus which allows the welding rate to be increased while maintaining an acceptably smooth weld surface.

The appellant agreed that the skilled person would appreciate that in order to increase the welding rate the energy input, i.e. heat input, to the workpieces would necessarily have to be increased, for example by increasing the pressure on the work pieces in the feed direction, which would lead to an increase in the generation of frictional heat between the work pieces and the pin and shoulder of the distal end of the friction stir welding tool. The appellant also agreed that the skilled person would recognise that the increased heat input was not limited to the workpieces only, but that also the tool itself would have to absorb part of the additional heat. Further the appellant agreed that the skilled person would recognise that the additional heat input would result in the risk of overheating the tool at high welding rates so that the skilled person would consider that the additional heat input to the tool would have to be dissipated by some appropriate means in order to avoid damaging it.

3.2 The Board considers that it would then be obvious to the skilled person to cool the friction stir welding

tool in order to dissipate the additional heat. Cooling of welding tools in the general field of joining metals by welding to avoid overheating is well known to the skilled person, as was also recognised by the appellant (letter of 8 April 2010, page 2, last sentence in the penultimate paragraph). E1 represents an example, from a closely related technical field, of cooling the tool in a friction welding apparatus in order to avoid overheating (see col. 4, lines 39-42). The straightforward way to cool the friction stir welding tool is to provide the apparatus known from E7 with an appropriate device to deliver coolant to the tool. Devices for providing coolant are well known to the skilled person in the field of joining metals by welding in general, so that the provision of a coolant distribution device as defined in claim 4 would have been obvious and therefore does not involve an inventive step.

The appellant however contested that it would have been obvious to the skilled person to provide a coolant distribution device which directed the coolant around the distal end of the tool. In the appellant's view the skilled person would have foreseen that this would lower the temperature in the welding zone as well, which would in turn negatively affect the welding process so that the skilled person would not have considered to provide coolant in the weld zone.

The Board does not accept this argument. Once the skilled person had recognised that in order to prevent overheating of the tool the provision of a coolant is required, the skilled person would have immediately appreciated that this is most efficiently done if the coolant is provided at the location where the tool is primarily exposed to overheating, i.e. at the tool's

distal end. The skilled person would obviously consider removing heat from this location (as was also held to be the case by the opposition division) and not from other parts of the apparatus. It would thus have been obvious to the skilled person to direct the coolant at and around the tool's distal end. The skilled person would not be prevented from doing so by the potential negative impact on the welding process due to the presence of coolant in the heat affected zone. As has been stated above, cooling of welding tools is generally known to the skilled person and it is likewise known to the skilled person that coolant fluid can also be directed to the heat affected zone during the welding operation (see for example E3, E4 referred to in the passage bridging pages 5, 6, of the appellant's letter of 12 June 2010). The skilled person would appreciate that a controlled amount of coolant should be supplied to the tool and to the welding zone but obviously not so as to impede the welding process itself.

Also the fact that E7 presents tool size, shape and material as relevant parameters in the management of the thermal issues in the friction stir welding process does not alter the Board's finding on inventive step. The fact that other parameters affect the thermal conditions of the friction stir welding process does not mean that the application of features which belong to the general knowledge of the skilled person in the general technical field of joining metals by welding and which are used for their ordinary purpose in order to solve the objective technical problem would not be obvious.

3.3 The Board concludes that the subject-matter of claim 4 of the main request would have been obvious to the

skilled person and consequently does not involve an inventive step (Article 56 EPC). The appellant's main request is not allowable.

Auxiliary request I

4. Article 123(2) EPC

4.1 Auxiliary request I is identical to auxiliary request I submitted with the grounds of appeal and to that admitted into the proceedings by the opposition division in the underlying impugned decision.

4.2 Compared to claim 4 of the main request, claim 4 of this request has been amended by adding in the characterising portion inter alia the feature "*wherein the apparatus is adapted to control the amount of coolant to reduce the degree of adherence between the tool and the softened material to smoothen the weld surface; and to avoid removal of so much heat as to interfere with the welding operation.*"

4.3 The appellant indicated as a basis for this feature several passages in the description as originally filed. However, the only mention therein of controlling the amount of coolant is in relation to the description of a preferred embodiment of a friction stir welding apparatus (see page 7, line 11 to page 8, line 16), which is also schematically illustrated in Figure 2. According to this embodiment, a nozzle extends in proximity to the welding tool body. The nozzle is in fluid communication with a source of coolant. The coolant is supplied to the nozzle under pressure so that it exits the nozzle in a mist impinging directly onto the distal end of the tool and onto the surrounding workpiece (cf. page 7, line 32-37). On page

8, lines 12-16, it is stated: "[t]*he amount of coolant should be controlled to avoid removal of so much heat as to interfere with the welding operation. A coolant rate of about 0.01 gpm is usually suitable and the rate may be readily optimized for a specific application*." Neither the cited section of the description, nor any other passage of the application as filed, contains any further detail in regard of the way of controlling the amount of coolant to be delivered to the tool/weld surface. There is in particular no direct and unambiguous disclosure that the apparatus itself is adapted to control the amount of coolant. Nor do the features disclosed in the preceding part of the description of the embodiment amount to a clear and unambiguous disclosure that the apparatus is adapted to perform this function.

4.4 The appellant argued that the skilled person would take into account the small rate of coolant required to be dispensed (cf. page 8, line 15): it should be large enough to provide efficient cooling of the tool's distal end in order to reduce the degree of adherence between the tool body and the softened material to smoothen the weld surface (e.g. page 8, lines 10/11), and small enough to not remove too much excess heat (e.g. page 8, line 13/14). He would therefore understand that such control could not be carried out by an operator and would therefore necessarily require corresponding structural features for this purpose in the apparatus itself. The Board does not accept this argument.

First, the claim is not limited to a small coolant rate, in particular not to the rate cited as an example in the description (*ibid.*). Second, the Board cannot see any reason why the skilled person would have

derived from the reference to "usually suitable" coolant rate or the two constraints mentioned above, that necessarily the apparatus would be adapted to control the coolant amount/rate. The skilled person is only taught that the coolant rate has to be controlled so as to respect the two operational constraints and that the indicated coolant rate was suitable in this regard (but would have to be adapted if required, see page 8, line 16). The skilled person would understand that this could be achieved either by control means provided in the apparatus or, alternatively, by the manual control of the rate through the operator, even for small rates.

4.5 It follows that the subject-matter of claim 4 according to auxiliary request I contravenes the requirement of Article 123(2) EPC so that the patent may not be maintained on the basis of this request.

Auxiliary requests II, III, IV and IV'

5. These auxiliary requests were submitted after the appellant filed its grounds of appeal and consequently constitute amendments to the appellant's case. According to Article 13(1) RPBA, they may be admitted and considered at the Board's discretion. As regards the criteria which the Boards apply in the exercise of their discretion to admit amendments to a party's requests (and thus to its case), various factors can play a role. As a primary requirement the amendments suggested should generally be *prima facie* allowable, i.e. it should be immediately clear that they overcome the outstanding objections and do not introduce any new objections. Late filed requests should also normally not take the proceedings in an entirely new direction and should generally be convergent. It may be relevant

that they are designed to overcome new objections raised by the other party or the Board as opposed to objections which had previously been raised in the proceedings.

5.1 Amended claim 4 of auxiliary requests II and III is directed to a "*method for operating a friction stir welding apparatus for welding a workpiece*", and defines in addition to the features of the apparatus claim 4 of the main request the method features "*operating the coolant distribution device during welding so that...*" and "*controlling the amount of coolant...*".

5.1.1 The originally granted claims and the claims filed with the grounds of appeal do not comprise any claim directed to such method. The amendment therefore introduces subject-matter which has never been considered before and thereby changes substantially the framework of the appeal proceedings. This change is not justified by any new objection raised with respect to the higher ranking requests for the first time by the Board in its communication. In particular the objections under Articles 84 and 123(2) EPC mentioned in the Board's communication with respect to the then current auxiliary request I were in essence the same as the objections raised in the impugned decision. The filing of these requests is therefore incompatible with the need for procedural economy (Articles 13(1) RPBA).

5.1.2 Moreover, the amendments to claim 4 of auxiliary requests II and III are also not *prima facie* allowable because the subject-matter of amended claim 4 extends beyond the content of the application as filed (Article 123(2) EPC). Although the Board can agree with the appellant that the disclosure of a friction stir welding apparatus *per se*, as it is supported for

example by originally filed claim 9, implies for the skilled person that the apparatus will be operated in some way, so that a method of using or operating such apparatus in general could be regarded to be encompassed by the original disclosure, the Board considers that the specific method of operating of claim 4 is not disclosed. The claimed method is based on features taken from original claim 9 and from the description of the preferred embodiment on pages 7 and 8. Only in the context of this embodiment is it disclosed that the amount of coolant should be controlled to avoid removal of too much heat and thus so as not to interfere with the welding operation (page 8, lines 12 to 14). This passage does not enable the skilled person to directly and unambiguously derive that the feature "*controlling the amount of coolant...*" constitutes a (generalised) method feature in a (general) method of operating the apparatus.

5.2 In auxiliary requests IV and IV' claim 4 is again directed to a friction stir welding apparatus, in which however the critical feature "*the apparatus is adapted to control...*" in claim 4 of auxiliary request I has been replaced by the definition of the coolant distribution device being "*a nozzle able to produce a mist of coolant therethrough*".

5.2.1 Contrary to the appellant's argument, the feature added to the claim does not limit the apparatus to one which, in use, will necessarily and always direct the coolant in the form of a mist to the tool and workpiece. This is so because the type of coolant is not specified; according to the description page 8, lines 33/34, the coolant may be a liquid or air. Also, even where a liquid would be used as coolant, the claim does not define any particular pressure range for the coolant,

so that the claim encompasses an apparatus in which a liquid coolant could exit the nozzle as a jet. Also the data derived from pages 5 and 6 of the description is irrelevant since it relates to very specific operation and material conditions, which are not reflected by any amendment in claim 4. Hence, any particular technical effect allegedly achieved by the use of a mist of coolant for cooling the friction stir welding tool may not be taken into account when considering whether amended claim 4 of auxiliary requests IV and IV' involves inventive activity.

Nozzles are commonly used on coolant distribution devices. In the absence of a limitation in regard of the type of coolant and the pressure range for its supply to the nozzle it is not clear which particular structural limitation could be implied as regards the nozzle itself. Therefore it does not appear that the added feature could change the Board's decision on inventive step as given above for claim 4 of the main request.

5.2.2 Claim 4 of the auxiliary requests IV and IV' is thus not *prima facie* allowable.

5.3 In view of the above the Board decided to not admit any of auxiliary requests II to IV' into the proceedings (Article 13(1) RPBA).

Auxiliary request V

6. Auxiliary request V was submitted with the grounds of appeal as auxiliary request II and corresponds also to auxiliary request II underlying the impugned second interlocutory decision. Claim 4 of this request is directed to an apparatus and comprises again the

feature "*apparatus is adapted to control the amount of coolant...*". Contrary to the appellant's view the Board cannot see any basis in the passages referred to by the appellant (pages 3, 7, 8 and Figure 2) whereby the added features ("nozzle" and the intended delivery of the coolant in form of a mist) are disclosed as features which make the apparatus adapted to control the coolant amount. In particular the nozzle itself is not disclosed to any detail. Although the Board may accept that the nozzle contributes to the control of the coolant amount to be dispensed, just as every nozzle or fluid outlet inherently does, it is not directly and unambiguously derivable therefrom that the function of coolant amount control is to be performed by the apparatus itself by means of the nozzle. Consequently these amendments do not affect the Board's conclusion as regards the "apparatus-adapted-to-control" feature already reached in respect of claim 4 of auxiliary request I (cf. point 4 above). At least for this reason the patent cannot be maintained on the basis of auxiliary request V.

Auxiliary requests VI - IX, IX', X - XII

7. These requests have been filed after the appellant had filed its grounds of appeal, so that their admittance into the proceedings is to be considered along the same lines as with respect to auxiliary requests II-IV and IV' (cf. above point 5).

7.1 In claim 4 of auxiliary request VI the "apparatus control" feature has now been deleted again and features are added from the description which concern the location and direction in which the coolant is directed in relation to the welding direction. In auxiliary requests VII and VIII claim 4 is then again

directed to a method of operation and comprises further amendments which correspond to those carried out on the apparatus claims of auxiliary requests V and VI, respectively. Similarly, claim 4 of auxiliary requests IX and IX' is directed to the apparatus, without the "apparatus control" feature and comprises instead of the features added in auxiliary request VI other features taken from the description which concern a specific coolant rate and the delivery of coolant under pressure to the nozzle. Claim 4 of auxiliary request X then again is directed to a method of operation with similar amendments as in the apparatus claim of auxiliary request IX. Claim 4 of auxiliary requests XI and XII, respectively directed to the apparatus and the method of operation, comprise the combination of the amendments of auxiliary requests VI and IX and VIII and X, respectively.

7.2 It is apparent from the summary of the amendments to claim 4 of these auxiliary requests that all of them are directed to subject-matter going in diverging directions. Such constitution of requests - in which moreover each request introduces new subject-matter that is based essentially on features taken from the description and that has never been discussed in the proceedings before - is clearly contrary to the need for procedural economy.

7.3 Further, having regard to the substance of the amendments of these auxiliary requests, none of them appeared *prima facie* allowable in the above mentioned sense.

7.3.1 The added feature in claim 4 of auxiliary request VI contravenes the requirement of clarity of Article 84 EPC, in that it defines the position of the coolant

distribution device by reference to the "*direction of welding*" which is however only defined during the use of the apparatus. Contrary to the appellant's view, the Board is of the opinion that the claim is not limited by any structural feature to an apparatus which has a defined welding direction but encompasses also (e.g. a hand-held) apparatus which may be operated in whatever direction.

7.3.2 The amendments to claim 4 of auxiliary requests VII, VIII, X and XII do not overcome the objection of added subject-matter in regard to the "method of operation" since such a specific method is not directly and unambiguously derivable from the application as filed (see point 5.1.2 above). None of the cited passages referred to by the appellant (original claims 9, 10, pages 7, 8 and 11 as well as Figure 2) disclose a method of operating the embodiment of the apparatus and comprising a "mist impinging step" and a "coolant amount controlling step".

7.3.3 Compared to the subject-matter of claim 4 of auxiliary request IV, in claim 4 of auxiliary requests IX a specific coolant rate has additionally been defined. The Board does not consider that this amendment prima facie has the potential to lead to inventive subject-matter. There is no particular technical effect disclosed as occurring at this particular coolant rate which is independent of the type of coolant, the materials to be welded and the thickness of the workpieces, the particular friction stir welding tool's shape, size and material or the weld rate. Consequently a small coolant rate compared to other rates used in the prior art, such as in E4, disclosing a higher rate of 2 l/min for CO_2 as coolant, cannot in itself be regarded as a pointer to inventive activity. As has

been stated above (point 3), the provision of cooling means during friction stir welding in order to reduce the degree of adherence is considered to be obvious, independent of a specific rate of coolant, and cannot therefore be seen as counter intuitive.

7.3.4 Auxiliary request IX' was filed during the oral proceedings before the Board, thus at the latest possible moment in the proceedings. It was not immediately clear to the Board that the amendments to claim 4 would overcome the objection under Article 56 EPC, in particular in view of the fact that the coolant rate was still specified independently of the type of coolant and welding conditions (the tools' shape, size and material, workpiece properties, welding rate, etc; see above).

7.3.5 Finally auxiliary requests XI combines the features added in the respective auxiliary requests VI and IX. It is not *prima facie* allowable for at least the reasons given with respect to these requests (see for example point 7.3.1).

7.4 For the reasons given in points 7.2 and 7.3.1 - 7.3.5 the Board decided to exercise its discretion according to Article 13(1) RPBA not to admit auxiliary requests VI - IX, IX' and X - XII into the proceedings.

8. The appeal must therefore be dismissed. In the circumstances, the respondent's requests do not call for further comment.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

M. H. A. Patin K. Garnett

Decision electronically authenticated