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**Datasheet for the decision
of 3 November 2016**

Case Number: T 1741/12 - 3.5.03
Application Number: 06256522.1
Publication Number: 1804146
IPC: G05B19/4093, G05B19/4097,
G05B19/4099, B29C70/30,
B65H81/00
Language of the proceedings: EN

Title of invention:

Head assignment modeling and simulation for a Multiple Head
Tape Lamination Machine.

Patent Proprietor:

The Boeing Company

Opponent:

AIRBUS SAS (FR)/ AIRBUS OPÉRATIONS SAS (FR)/ AIRBUS OPERATIONS
LTD (GB)/ AIRBUS OPERATIONS GMBH (DE)/ AIRBUS OPERATIONS S.L.
(ES)

Headword:

Head assignment for tape lamination machine/BOEING

Relevant legal provisions:

EPC Art. 56
RPBA Art. 12(4), 13(1)

Keyword:

Inventive step (main and first to fifth auxiliary requests) -
no

Admissibility (sixth to ninth auxiliary requests) - no

Decisions cited:

G 0009/91, T 0881/09

Catchword:



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Case Number: T 1741/12 - 3.5.03

D E C I S I O N
of Technical Board of Appeal 3.5.03
of 3 November 2016

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 25 May 2012
revoking European patent No. 1804146 pursuant to
Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	F. van der Voort
Members:	T. Snell
	O. Loizou

Summary of Facts and Submissions

I. This appeal was lodged by the proprietor (henceforth, appellant) against the decision of the opposition division revoking European patent No. EP 1 804 146 on the ground that the subject-matter of claim 1 of a main request and of three auxiliary requests did not involve an inventive step (Article 100(a) EPC).

II. The following documents are relevant to the board's decision:

E1: Olsen et al, "Automated Composite Tape Lay-up using Robotic Devices"; Proceedings of the International Conference on Robotics and Automation, Los Alamitos, IEEE Comp Soc Press, US, vol. conf. 10, 2 May 1993, pages 291-297; and

E2: US 2005/0039843.

III. In the statement of grounds of appeal, the appellant requested as a main request that the decision be set aside and that the patent be maintained as granted. The appellant also filed first to four auxiliary requests.

IV. In a response to the appeal, the opponent (henceforth, respondent) requested that the appeal be dismissed.

The respondent argued, inter alia, that the subject-matter of claim 1 of each of the requests did not involve an inventive step in the light of the documents E1 and E2 taken in combination.

V. Both parties conditionally requested oral proceedings.

- VI. In a communication accompanying a summons to attend oral proceedings, the board, *inter alia*, gave a preliminary opinion that the subject-matter of claim 1 of the main and certain auxiliary requests did not involve an inventive step in the light of E1 and E2. It also stated that it was minded not to admit certain auxiliary requests (cf. Article 12(4) RPBA).
- VII. In a response to the board's communication, the appellant, with a letter dated 30 September 2016, filed a new set of nine auxiliary requests to replace the auxiliary requests on file.
- VIII. Oral proceedings took place on 3 November 2016.

The appellant requested that the decision under appeal be set aside and that, by way of a main request, the opposition be rejected or, in the alternative, that the patent be maintained in amended form on the basis of the claims of one of first to ninth auxiliary requests, all auxiliary requests as filed with the letter dated 30 September 2016.

At the end of the oral proceedings, the chairman announced the board's decision.

- IX. Claim 1 of the **main request** (i.e. claim 1 as granted) reads as follows:

"A method of modeling head assignments of a multihead composite material application machine having a set of heads, the method comprising:
receiving a ply geometry (72) for a composite part;
receiving a configuration (70) for the multihead composite material application machine;

generating (92) a constellation of head locations in response to the ply geometry (72) and the configuration (70) for the multihead composite material application machine;
assigning (96) a head location of the constellation of head locations to a corresponding head of the set of heads; and
generating (102) a graphical model that simulates the multihead composite material application machine applying the composite material upon the composite part in response to the assigned head locations."

Claim 1 of the **first auxiliary request** is the same as claim 1 of the main request except that the feature "assigning (96) a head location of the constellation of head locations to a corresponding head of the set of heads" reads "assigning (96) head locations of the constellation of head locations to corresponding heads of the set of heads".

Claim 1 of the **second auxiliary request** is the same as claim 1 of the first auxiliary request except that the wording "computer implemented" is inserted before the word "method" in the first line.

Claim 1 of the **third auxiliary request** is the same as claim 1 of the second auxiliary request except that the wording "and of controlling such a machine," is inserted before the wording "the method comprising" and the wording "; and controlling the multihead composite material application machine to apply the composite material upon the composite part in response to the assigned head locations" is added to the end of the claim.

Claim 1 of the **fourth auxiliary request** is the same as claim 1 of the second auxiliary request except that the following wording is added to the end of the claim:

", the method further comprising:

receiving a target tool file (64) corresponding to the composite part;

generating (94) a path and a target tool surface model in response to receiving the target tool file (64);

generating a sequence of constellation passes (76) in response to receiving the constellation of head locations, the path and the target tool surface model, wherein the sequence of constellation passes (76) includes a corresponding constellation of head locations for each pass of the multihead composite material application machine along the target tool surface model;

generating (98) a set of head events in response to the sequence of constellation passes, wherein the set of head events includes movement instructions for the set of heads."

Claim 1 of the **fifth auxiliary request** reads as follows:

"A computer implemented method of modeling head assignments of a multihead composite material application machine having a set of heads on a tool carriage, the method comprising:
receiving a ply geometry (72) for a composite part;
receiving a configuration (70) for the multihead composite material application machine;

generating (92) constellations of head locations in response to the ply geometry (72) and the configuration (70) for the multihead composite material application machine wherein separate constellations [sic] are generated for some or each combination of ply angle and direction of travel of the tool carriage;
assigning (96) head locations of each constellation of head locations to corresponding heads of the set of heads; and
generating (102) a graphical model that simulates the multihead composite material application machine applying the composite material upon the composite part in response to the assigned head locations."

Claim 1 of the **sixth auxiliary request** is the same as claim of the second auxiliary request except that the wording "checking that, in applying the composite material upon the composite part in response to the assigned head locations, the heads will not collide with each other" is inserted between "assigning (96) head locations ... to corresponding heads of the set of heads;" and "and".

Claim 1 of the **seventh auxiliary request** is the same as claim 1 of the fourth auxiliary request except that the wording "including one or more standard heads configured to apply composite tape having a standard or nominal width of three or six inches and one or more specialized heads configured to apply composite tape having nonstandard width" is inserted before the wording ", the method comprising".

Claim 1 of the **eighth auxiliary request** is the same as claim 1 of the fourth auxiliary request except that the wording "to be applied over the surface of a target manufacturing tool" is added after the wording

"receiving a ply geometry (72) for a composite part", and the wording ", wherein the constellation is an arrangement of relative head locations configured to satisfy constraints of the multihead composite material application machine with respect to where the heads can be placed without interfering with each other, with the structure of the multihead composite material application machine, and/or with the structure of the target manufacturing tool" is added after the wording "generating (92) a constellation for the multihead composite material application machine".

Claim 1 of the **ninth auxiliary request** is the same as claim 1 of the eighth auxiliary request except that before "generating (102) ..." the word "and" is deleted and the wording "; and using a rate simulator including a discrete event simulation program to mime the functions of the multihead composite application machine and predict its potential performance" is added before the wording "the method further comprising".

Reasons for the Decision

1. Main request - claim 1 - inventive step

1.1 The present patent concerns a method and system of modelling a composite material application machine, e.g. a tape laying machine, for producing composite parts such as aircraft fuselage sections. In order to speed up the application of the composite material, machines have been conceived which have multiple heads (cf. e.g. document E2). Claim 1 is directed to a method for modelling head assignments of a multihead composite material application machine having a set of heads.

1.2 The question arose in the opposition procedure of whether the subject-matter of claim 1 concerned excluded non-technical subject-matter within the meaning of Article 52(2)(c) EPC. This was answered in the negative by the opposition division (cf. point 1.1 of the reasons). It is however not necessary to consider this matter, because, as set out below, the board came to the conclusion that the subject-matter of claim 1 lacked inventive step, even if it is assumed that all features of the claim contribute to the solution of a technical problem.

1.3 It was common ground that document E1 represents the closest prior art. E1 discloses a method of modelling a tape laying machine with a single head comprising generating a graphical model simulating the machine. It was not in dispute that E1 discloses the features of receiving a ply geometry for a composite part, receiving a configuration for the [single head] machine, and generating a graphical model that simulates the composite material application machine applying the composite material upon the composite part (cf. the impugned decision, point 1.3 of the reasons, features a), b) and e)).

1.4 It follows that the subject-matter of claim 1 essentially differs from the disclosure of E1 in that there are multiple heads, which, as argued by the appellant in respect of inventive step, is particularly relevant to the following features of claim 1 (using the same lettering as used in the impugned decision):

c) generating a constellation of head locations in response to the ply geometry and the configuration for the multihead composite material application machine; and

d) assigning a head location of the constellation of head locations to a corresponding head of the set of heads.

1.5 For the sake of consistency with the antecedent features and in order to make sense of the claim technically, step c) is interpreted by the board as meaning "assigning head locations_u ... to corresponding heads_u of the set of heads". This in fact corresponds to the clarified version of claim 1 filed as the first auxiliary request and corresponds to the interpretation given to claim 1 by the appellant.

1.6 As a matter of further claim interpretation, the board understands the term a "constellation of head locations" generally as a description of the location of the heads, in particular when laying the composite material. The board also considers that, since the heads have several degrees of motion, including rotation, the specification of the rotational position may also be part of the location information.

1.7 The problem to be solved starting out from E1 is considered as being how to adapt the simulation method disclosed therein for a multihead environment, such as, e.g., the multiple head automated composite laminating machine disclosed in E2.

1.8 More specifically, E2 discloses a tape-laying machine in which a plurality of heads 208 are positioned around a ring 212 (cf. Fig. 2). The board considers that the locations of the set of heads, when laying down a tape, form a "constellation of heads" within the meaning of claim 1. The heads are controlled simultaneously by numerical control (NC) (cf. paragraph [0041]), and

essentially move together relative to a cylindrical mandrel surface as defined by a ply geometry, in which limited individual position adjustment is also provided for (cf. paragraph [0051]). This machine configuration in fact essentially corresponds to that described in paragraph [0039] of the patent in suit, which states "the course head manager 20 can arrange the heads in a fixed constellation configuration on the tool carriage, which can be moved over the surface".

1.9 In the board's view, step c) derives straightforwardly by adapting E1 to a multihead environment. In E1, the movement of the single head is simulated in dependence on the ply geometry and the machine configuration (which is regarded as a mathematical description of the machine). This point was not in dispute. Where there are several heads, as in E2, it is self-evident that all head locations would have to be specified in the simulation, so that the constellation of heads would be dependent on the ply geometry and the multihead machine configuration. Consequently, step c) does not contribute to inventive step.

1.10 The appellant argued that even if the locations of the heads in E2 could be regarded as a constellation of heads (i.e. feature c)), there would be no need for assignment step d). This was because the heads in E2 were fixed relative to each other. The point of the two features c) and d) was that the very complex multihead programming problem was broken down into two steps. E2 gave no hint towards a two-stage approach. Indeed, it mentioned only briefly programming the machine (in paragraph [0041]). Consequently, the invention filled the gap that was required to combine E1 and E2.

1.11 The board however finds the appellant's arguments unconvincing. With respect to E2, the board notes that a particular tape course 218 (which would correspond to a head location during the simulation) could be assigned to any of the heads 208 on the circular ring 212 (cf. Fig. 2). It therefore follows that it would be necessary to specify which head location on the mandrel surface corresponds to which head. Even if it appears from the configuration of Fig. 2 that it does not matter which head is chosen to lay a particular tape course, because the heads are in a fixed relationship with each other and equidistant around the circular ring 202, an assignment would still have to be made. That notwithstanding, E2 (cf. paragraph [0039]) also discloses another embodiment in which each head can be moved laterally in order to lay tape in a circumferential or hoop direction, in such a way that the tape courses are adjacent and do not overlap. It follows that the lateral displacements must all be different from one another. Here it would be necessary to choose which tape courses (locations) are to be laid by which heads, i.e. to assign the constellation of head locations to corresponding heads. Therefore, assignment d) derives obviously from E2.

1.12 For the above reasons, the board concludes that the subject-matter of claim 1 does not involve an inventive step (Articles 52(1) and 56 EPC).

2. *First to third auxiliary requests - claim 1 - inventive step*

2.1 With regard to claim 1 of each of these requests, none of the amendments made with respect to claim 1 of the main request make any contribution to inventive step for the following reasons:

Claim 1 of the first auxiliary request is merely a clarified version of granted claim 1, in that the claim recites head locations and corresponding heads instead of respectively a head location and a corresponding head. However, as stated above, claim 1 of the main request is interpreted in this sense already.

Claim 1 of the second auxiliary request adds the feature that the method is computer-implemented. However, both E1 and E2 concern computer-implemented methods.

Claim 1 of the third auxiliary request adds the feature of controlling the machine in response to the assigned head locations. However, the aim of the simulation of E1 is ultimately to control the head movements of a real machine (cf. E1, page 297, right-hand col., 2nd paragraph). The same would obviously apply to a simulation of a multihead machine based on combining E1 and E2.

- 2.2 The appellant presented no counter-arguments.
- 2.3 The board concludes that the subject-matter of claim 1 of each of the first to third auxiliary requests does not involve an inventive step (Articles 52(1) and 56 EPC).
- 3. *Fourth auxiliary request - claim 1 - inventive step*
 - 3.1 Claim 1 of the fourth auxiliary request differs from claim 1 of the main request essentially in that the features of granted claims 2 to 5 have been added.

3.2 It does not appear to be contested that the features of granted claims 2 and 3 are disclosed or at least rendered obvious by E1. The appellant instead drew attention to the features of granted claims 4 and 5, namely:

generating a sequence of constellation passes , wherein the sequence of constellation passes includes a corresponding constellation of head locations for each pass of the multihead composite material application machine along the target tool surface model; and

generating a set of head events in response to the sequence of constellation passes, wherein the set of head events includes movement instructions for the set of heads.

3.3 With respect to these features, the appellant argued that the programming problem was broken down into yet further steps. The appellant contended that the skilled person would not arrive at the solution of first generating a sequence of constellation passes and then generating a set of head events, i.e. movement instructions for the set of heads, by combining E1 and E2.

3.4 The board however disagrees. In the board's view, the features added to claim 1 are essentially already present in E1 (cf. the impugned decision, point 4.1, features f) to i)), modified in order to take account of the multihead configuration of the machine of E2.

3.5 In this respect, E1 breaks down the tape-laying method into a sequence of steps in an analogous way to that now claimed. Firstly, in E1, the entire sequence of tape courses is generated (cf. page 297, left-hand col.,

2nd paragraph), which corresponds to the feature of generating a sequence of passes of the single head location. Then the movement instructions for the single head are generated (cf. page 297, 4th paragraph). Faced with the problem of programming the multiple heads of the machine of E2, the skilled person would apply the same principle, and would thus arrive at the claimed method without requiring inventive skill.

3.6 Consequently, the board concludes that the subject-matter of claim 1 of the fourth auxiliary request does not involve an inventive step (Articles 52(1) and 56 EPC).

4. *Fifth auxiliary request - claim 1 - inventive step*

4.1 Claim 1 of the fifth auxiliary request differs from claim 1 of the main request in that (i) the method is computer-implemented, (ii) the set of heads is on a tool carriage, and (iii) separate constellations are generated for some or each combination of ply angle and direction of travel of the tool carriage.

4.2 Re (i): As has been stated above, the aspect of being computer-implemented does not contribute to inventive step.

Re (ii) In E2, the set of heads is on a tool carriage (ring 212).

Re (iii) In E2, the ring 212 may translate along the entire length of the tool and also rotate at the same time (cf. paragraph [0036]), such that the respective heads move respectively in a diagonal direction across the mandrel surface, as shown in Fig. 2. The heads may also be moved laterally to each other in order to apply

tape in circumferential or hoop direction without the tape courses overlapping each other (cf. paragraph [0039]). These two examples show that different constellations are required based on the direction of travel of the tool carriage and on the ply angle. Further, the passage of E1, page 297, lines 1-5 and 15-17, shows that each tape course (head location) is dependent on the ply angle and the direction of travel. For the multihead machine, it follows that separate constellations are required for some or each combination of ply angle and direction of travel of the tool carriage.

4.3 The appellant argued that it was not correct to analyse inventive step using a "salami" approach, by which the board understands an approach in which each successively added feature is examined by itself for inventive step, instead of considering the claim as a whole. If the claim were considered as a whole, it would be apparent that the skilled person would require several steps in order to arrive at the claimed subject-matter. The appellant argued that, in the present case, the claimed subject-matter was moving further and further away from E2, which was almost silent about these matters.

4.4 The board however disagrees that the claimed subject-matter is far away from a method produced by the combination of E1 and E2. On the contrary, as explained above, these documents contain clear hints which would lead the skilled person to the claimed approach. Further, the only step to be taken here is essentially to combine the two documents E1 and E2, so that there is no accumulation of several steps. Consequently, the board found the appellant's argument unconvincing.

5. *Sixth auxiliary request - admissibility*

5.1 The sixth auxiliary request essentially corresponds to the fourth auxiliary request as filed with the statement of grounds of appeal.

5.2 Claim 1 (see point IX above) incorporates the feature "checking that ... the heads will not collide with each other". This feature has hitherto never been claimed.

5.3 In accordance with Article 12(4) RPBA, the board has the discretion to not admit requests which could have been presented before the first instance (here, the opposition division). In the board's view, the sixth auxiliary request, since it incorporates entirely new matter taken from the description, could, and indeed should, have been presented before the opposition division and not for the first time in appeal proceedings. The board points out that the primary purpose of opposition appeal proceedings is to examine the correctness of the decision (cf. G 9/91, OJ EPO 1993, 408, 419, reasons, 18) rather than provide an opportunity to amend the claims by introducing new features from the description, requiring entirely new issues to be examined.

5.4 The board further notes that at the oral proceedings before the opposition division, the proprietor expressly declined the opportunity to present another request (cf. point 17 of the minutes).

5.5 The board also points out that, as the features added are taken from the description, it is unclear whether they have been the subject of the search. As a consequence, even in the hypothetical case that the subject-matter of claim 1 were not obvious having

regard to the prior art on file, the board would not be in a position to maintain the patent in amended form on the basis of this request, but would have to remit the case to the opposition division for further prosecution (see also the respondent's reply to the statement of grounds of appeal dated 14 February 2013, point 7.1.2). This situation is analogous to that dealt with in decision T 881/09, point 4 of the reasons, where it was decided that an auxiliary request which incorporated a probably unsearched feature taken from the description be not admitted, using the board's discretionary power under Article 12(4) RPBA.

5.6 At the oral proceedings, the appellant argued that the request should be admitted as it was simple to understand, had been filed at the earliest opportunity in the appeal procedure, i.e. with the statement of grounds of appeal (i.e. by way of the fourth auxiliary request), and was specifically focused on the multiple head aspect. The appellant also alleged that the request had not been filed during the opposition procedure as this had taken an unexpected turn when the opposition found the requests on file to lack inventive step.

5.7 The board however considers that the proprietor should have been prepared for the eventuality that its request(s) on file would be refused by the opposition division due to lack of inventive step with respect to the combination of E1 and E2, as this had been raised in the notice of opposition. Further, none of the other reasons alter the fact that the board would be forced to remit the case to the opposition division if the request were to be admitted.

5.8 In the letter dated 30 September 2016, the appellant stated that a reason for filing the sixth auxiliary request was to respond to the board's observations regarding the need for claim 1 to be functionally limited to an adequately defined technical process [to be considered as a non-intellectual activity]. However, leaving aside the fact that the request was essentially filed before the board had made observations (i.e. as the fourth auxiliary request filed with the statement of grounds of appeal), whether or not claim 1 is limited to an adequately defined technical process is not the issue here and therefore alone not a justification for admitting the request.

5.9 For these reasons, the board decided not to admit the sixth auxiliary request (Article 12(4) RPBA).

6. *Seventh to ninth auxiliary requests - admissibility*

6.1 These requests were filed in response to the board's communication. The admitting of these requests is therefore at the discretion of the board (Article 13(1) RPBA). This discretion shall be exercised in view of inter alia the need for procedural efficiency.

6.2 Claim 1 of each of these requests (see point IX above) includes new features taken from the description and makes an entirely fresh case. Consequently, the comments made in points 5.3 to 5.7 above in respect of claim 1 of the sixth auxiliary request apply mutatis mutandis. It follows that admitting the requests would require remittal of the case to the opposition division.

6.3 The appellant stated that the requests were a bona fide attempt to overcome problems related to sufficiency of

disclosure which the board had raised in its communication accompanying the summons. However, this reason is not relevant either to the substantive issue of lack of inventive step or to the matter of procedural efficiency discussed above.

6.4 Consequently, the board decided to not admit the seventh to ninth auxiliary requests (Article 13(1) RPBA).

7. *Conclusion*

As there is no allowable request, it follows that the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



G. Rauh

F. van der Voort

Decision electronically authenticated