

Internal distribution code:

- (A) Publication in OJ
(B) To Chairmen and Members
(C) To Chairmen
(D) No distribution

**Datasheet for the decision
of 29 November 2007**

Case Number: T 0046/03 - 3.4.01

Application Number: 96943535.3

Publication Number: 0868764

IPC: H01Q 21/00

Language of the proceedings: EN

Title of invention:

Low-cost communication phased-array antenna

Applicant:

The Boeing Company

Opponent:

-

Headword:

-

Relevant legal provisions:

-

Relevant legal provisions (EPC 1973):

EPC Art. 54, 111(1)

EPC R. 67

Keyword:

"Novelty (main request) (yes)"

"Remittal (yes)"

"Reimbursement of appeal fee (no)"

Decisions cited:

-

Catchword:

-



Case Number: T 0046/03 - 3.4.01

D E C I S I O N
of the Technical Board of Appeal 3.4.01
of 29 November 2007

Appellant:

The Boeing Company
P.O. Box 3707
M.S. 13-08
Seattle
Washington 98124-2207 (US)

Representative:

Land, Addick Adrianus Gosling
Arnold & Siedsma
Advocaten en Octrooigemachtigden
Sweelinckplein 1
NL-2517 GK Den Haag (NL)

Decision under appeal:

Decision of the Examining Division of the
European Patent Office posted 5 August 2002
refusing European application No. 96943535.3
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: B. Schachenmann
Members: G. Assi
F. Neumann

Summary of Facts and Submissions

I. The appellant (applicant) lodged an appeal, received on 4 October 2002, against the decision of the examining division, dispatched on 5 August 2002, refusing the European patent application No. 96943535.3 (international publication number WO 97/23923). The fee for the appeal was paid on 4 October 2002. The statement setting out the grounds of appeal was filed on Monday, 16 December 2002.

II. In the contested decision, the examining division held that the subject-matter of claim 1 of the main request then on file lacked novelty (Article 54 EPC) with regard to the following document:

(D1) US-A-5,276,455.

Moreover, the examining division held that the subject-matter of claim 1 according to four auxiliary requests then on file did not involve an inventive step (Article 56 EPC) with respect to the combination of the disclosures of D1 and the following further document:

(D2) PROCEEDINGS OF THE ANTENNAS AND PROPAGATION SOCIETY INTERNATIONAL SYMPOSIUM (APSYS), ANN ARBOR, 1993, volume 2, 28 June 1993, INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, pages 1009-1012, XP000420017, K. A. Shalkhauser and M. P. Goetz: MULTI-ELEMENT MULTI-LAYER PACKAGING FOR PHASED ARRAY ANTENNA APPLICATIONS.

III. Oral proceedings before the Board were held on 29 November 2007.

IV. At the oral proceedings, the appellant requested that the decision under appeal be set aside and that the case be remitted to the examining division for further prosecution on the basis of sets of claims according to a main request and auxiliary requests I, II, II', III, III', IV, V, VI and VII filed with a letter of 20 November 2007. Furthermore, the appellant requested that the appeal fee be reimbursed.

V. Claim 1 of the main request presently on file corresponds to that of the main request underlying the decision under appeal with the only difference that reference signs have been introduced. Its wording reads as follows:

"A phased-array antenna structure (200) comprising:

an antenna waveguide structure (404) including a plurality of waveguides (406), said antenna waveguide structure being capable of propagating electromagnetic (EM) signals within said plurality of waveguides;

a plurality of electronic modules (408), each electronic module of said plurality of electronic modules being coupled to a corresponding waveguide of said plurality of waveguides of said antenna waveguide structure, wherein each electronic module of said plurality of electronic modules is capable of adjusting a phase of an EM signal that is propagated in said corresponding waveguide of said plurality of waveguides of said antenna waveguide structure; and

a multilayer wiring board (416) coupled to said plurality of electronic modules, said multilayer wiring board including EM signal propagation paths coupled to said plurality of electronic modules, wherein said EM

signal propagation paths are capable of propagating a signal corresponding to an EM signal propagated in a waveguide of said plurality of waveguides of said antenna waveguide structure."

VI. The appellant's arguments may be summarized as follows.

The document D1 disclosed a phased-array antenna which, due to its thickness, was arranged in a recess in the external skin of an aircraft (see Figure 6A). The thickness was caused by the provision of three honeycomb structures, i.e. a feed honeycomb, a module honeycomb and an antenna honeycomb (see Figure 7). Electronic modules were placed in the module honeycomb orthogonally to the surface of the outer cover of the antenna. Moreover, multilayer wiring boards were provided, i.e. a power wiring board supplying DC power to the electronic modules via metallization patterns and a logic wiring board distributing clock and logic signals to the electronic modules also via metallization patterns. The multilayer wiring boards were thus intended for supplying power and controlling the electronic modules so as to achieve beam steering. Propagation paths for high-frequency electromagnetic signals were not provided on the multilayer wiring boards. Therefore, the subject-matter of claim 1 of the main request was novel over the disclosure of D1.

The document D2 described a phased-array antenna with a "brick" architecture (see Figure 1) teaching away from making the antenna thinner. The document also proposed a microstrip patch antenna with a "tile" architecture without, however, disclosing any details of such

antenna suitable for achieving the object of the invention.

In the decision under appeal, the examining division refused the main request for lack of novelty and the auxiliary requests for lack of inventive step. However, if the Board acknowledged novelty of claim 1 of the main request over D1, the starting point relied upon by the examining division for assessing inventive step would no longer be correct. As the difference between claim 1 of the main request and the disclosure of D1 was of a substantial nature, the case should be remitted to the examining division for reconsideration of the issue of inventive step in the light of the Board's conclusions on novelty over D1.

The reimbursement of the appeal fee was requested because the examining division was biased against the present application in view of the conduct of the oral proceedings on 22 July 2002, during which no feedback was given by the examining division on the appellant's arguments, and of the statement in point 8 of the Reasons of the decision under appeal.

Reasons for the Decision

1. The appeal is admissible.
2. *Claim 1 of the main request*
 - 2.1 Using the language of the claim, the document D1 (see Figures 6A-6D, 7, 16 and 17 with the corresponding

description) discloses a phased-array antenna structure comprising, inter alia, the following features:

- an antenna waveguide structure 132 (antenna honeycomb 132) including a plurality of waveguides 132a, the antenna waveguide structure 132 being capable of propagating electromagnetic signals within the plurality of waveguides 132a,
- a plurality of electronic modules 130, each electronic module 130 being coupled to a corresponding waveguide 132a of the antenna waveguide structure 132 and, moreover, being capable of adjusting the phase of an electromagnetic signal that is propagated in the corresponding waveguide 132a, and
- a power multilayer wiring board 140a and a logic multilayer wiring 140b both coupled to the plurality of electronic modules 130; alternatively, a single multilayer wiring board providing both power and logic can be provided (see column 18, lines 18-22).

2.2 In the Board's view, the multilayer wiring board according to D1 does not include electromagnetic signal propagation paths coupled to the plurality of electronic modules 130 and capable of propagating signals corresponding to the electromagnetic signals propagated in the waveguides 132a.

Indeed, the power multilayer wiring board 140a simply includes metallization patterns 234 and 236 for supplying the positive and negative DC power, respectively, to each of the electronic modules. As regards the logic multilayer wiring board 140b, it only

includes metallization patterns 238 and 240 for supplying the clock signals and logic data signals, respectively, to each of the electronic modules (see column 20, lines 16-42; Figures 16 and 17; claims 3-6). Figures 24 and 25 are similar to Figures 16 and 17, respectively, and show the case in which ground is also brought in through the multilayer wiring boards (see column 25, lines 16-20).

The findings above are supported by the description of the operation of the phased-array antenna according to D1.

In a transmit mode (see Figure 7), a signal enters into the waveguide feed network 112 and the feed honeycomb 134. At the output of the dielectrically loaded feed honeycomb waveguides 134a the signal is coupled into the electronic modules 130 by means of couplers without metal-to-metal contacts. The Figures 5A, 11B, 12B, 13A and 13B show examples of such couplers which are part of the electronic modules (see column 5, lines 3-17; column 15, line 38 to column 16, line 59). The signal is then processed by the electronic modules, in particular amplified and phase shifted, and sent into the dielectrically loaded antenna honeycomb waveguides 132a by means of non-contacting couplers. Each of the antenna honeycomb openings thus radiates the electromagnetic signal.

In a receive mode, an electromagnetic signal is received in the antenna honeycomb 132 and sent through the module honeycomb 128 to the feed honeycomb 134 and then to the waveguide feed network 112. The amplifiers within the electronic modules 130 must thus be modified

so that the modules act as receivers rather than transmitters. The non-contacting couplers, however, need not be changed.

Thus, the Board cannot agree with the findings of the examining division that the arrangement of claim 1 of the main request and that of D1 are the same. In D1 the electronic modules are indeed coupled to the multilayer wiring boards, but the signal corresponding to the electromagnetic signal in the waveguide is not propagated through the multilayer wiring boards which serve simply to provide electrical and logic connections to the electronic modules and are not arranged with electromagnetic signal propagation paths. Instead, it is the electronic modules which include the electromagnetic signal propagation paths in D1.

2.3 In conclusion, the subject-matter of claim 1 of the main request is novel over the disclosure of D1.

3. *Remittal of the case*

3.1 During the appeal procedure, the Board took note of all the requests and arguments submitted by the appellant with the grounds of appeal and with the letters of 29 October 2007 and 20 November 2007. In particular, the Board considered the issues of clarity (Article 84 EPC), disclosure (Article 123(2) EPC), novelty (Article 54 EPC) and inventive step (Article 56 EPC) in preparation for the oral proceedings on 29 November 2007. A careful examination of the application as originally filed and of the invention as claimed according to the requests presented was thus carried out. In this way, the Board recognised the essential

role played by the multilayer wiring board of claim 1 which includes electromagnetic signal propagation paths coupled to the plurality of electronic modules. In particular, this feature, which in the Board's view is not disclosed by D1, appears to be essential for achieving the object of the invention of providing a thinner antenna structure (see grounds of appeal, page 3, last paragraph). The Board, however, leaves open the question whether further essential features should be introduced in the claim in order to achieve the said object.

3.2 In the decision under appeal, the examining division held that the above mentioned feature concerning the multilayer wiring board was known from D1. It follows that the examining division's judgment on inventive step of the subject-matter of claim 1 of the auxiliary requests is based on an incorrect assumption concerning an essential feature of the invention. In other words, the issue is not whether the features introduced into claim 1 of each of the auxiliary requests are per se obvious but whether the combination of the novel feature of the multilayer wiring board with the added features according to each of the auxiliary requests are rendered obvious by the cited state of the art.

3.3 As the facts underlying the examining division's decision are incorrect in the light of the Board's judgment on novelty of the subject-matter of claim 1 of the main request on file, the appellant's request for remittal of the case to the examining division for further prosecution pursuant to Article 111(1) EPC (second sentence, second alternative) is equitable in order to allow inventive step to be assessed in two

instances, if necessary. In such a case, the Board considers the legal uncertainty resulting from the remittal twelve years after the priority date of the present application to be acceptable owing to the peculiarity of the present case and to the appellant's interest of having its case examined in two instances.

4. *Reimbursement of the appeal fee*

4.1 As laid down in Rule 67 EPC, the reimbursement of the appeal fee shall be ordered if the Board deems the appeal to be allowable and if such reimbursement is equitable by reason of a substantial procedural violation.

4.2 The Board cannot identify any substantial procedural violation.

The minutes of the oral proceedings on 22 July 2002 do not lead the Board to entertain any suspicion that the examining division was biased against the appellant's representative.

Moreover, they do not permit to conclude that the appellant's right to be heard (Article 113(1) EPC) has been violated. In particular, it results that all the requests then on file have been discussed and that, thereafter, the appellant has been asked whether it had any further arguments. In this respect, the examining division was not obliged to give a feedback on the representative's arguments.

4.3 With regard to the statement in point 8 of the Reasons of the decision under appeal, it may, in its generality, be regarded as inappropriate and not supported by reasons. It is, however, not sufficient to conclude that the examining division was biased against the application.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the examining division for further prosecution on the basis of sets of claims according to a main request and auxiliary requests I, II, II', III, III', IV, V, VI and VII filed with a letter of 20 November 2007.
3. The request for reimbursement of the appeal fee is rejected.

The Registrar

The Chairman:

R. Schumacher

B. Schachenmann