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D E C I S I O N
of 9 December 2005

Case Number: T 1192/03 - 3.4.02

Application Number: 95305686.8

Publication Number: 0702253

IPC: G02B 6/34

Language of the proceedings: EN

Title of invention:

Frequency routing device having a wide and substantially flat passband

Applicant:

AT&T Corp.

Headword:

-

Relevant legal provisions:

EPC Art. 84

Keyword:

"Main request: too broad and not allowable under Article 84 EPC"

"Auxiliary requests: not admitted under Article 10b(1) and 10b(3) RPBA because not readily allowable"

Decisions cited:

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Catchword:

-



Case Number: T 1192/03 - 3.4.02

D E C I S I O N
of the Technical Board of Appeal 3.4.02
of 9 December 2005

Appellant:

AT&T Corp.
32 Avenue of the Americas
New York
NY 10013-2412 (US)

Representative:

Sarup, David Alexander
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Decision under appeal:

Decision of the Examining Division of the
European Patent Office posted 11 June 2003
refusing European application No. 95305686.8
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: A. Klein
Members: A. Maaswinkel
J. Willems

Summary of Facts and Submissions

- I. The appellant (applicant) lodged an appeal, received on 29 July 2003, against the decision of the examining division, dispatched on 11 June 2003, refusing the European patent application No. 95305686.8. The fee for the appeal was paid on 29 July 2003. The statement setting out the grounds of appeal was received on 25 September 2003.
- II. In its decision the examining division had refused the patent application for the reason that it did not meet the requirements of Article 83 EPC. It was objected that in claims 1 and 4 the optical frequency routing devices were defined by the transmission coefficients of the optical paths which should exhibit a flat and wide passband. In particular reference was made to "the desiderata for the values of the transmission coefficients (summarized in conditions (1) and (2) on page 9 of the description and in claims 1 and 4); and the condition that the optical paths must exhibit the same optical length". Furthermore it was objected that it was not unambiguously disclosed how these desired values for the transmission coefficients could be obtained.
- III. In the statement of grounds of appeal the appellant made the following comments in support of the patentability of the invention as defined in the set of claims on which the decision of the examining division had been based.

The appellant identified in a first aspect of the invention that the width and the spacing of the transmission coefficients of the routers were determined by the corresponding width and spacing of the waveguides 32 (referring to Figure 1). According to the appellant, "the overlap of adjacent transmission coefficients can be substantially maximized by simply maximizing the coupling between corresponding waveguides (by reducing the gap between the waveguides)". As a second aspect the embodiment wherein one router was a conventional Mach-Zehnder arrangement had been mentioned. In a third aspect, referring to Figure 4, the idea of providing substantially maximum overlap for the transmission coefficients of various paths for the individual router devices in order to provide approximately unity transmission had been presented.

In view of these three aspects and the specification the skilled person would readily understand which parameters were to be adjusted; more in detail, that he would understand that "transmission coefficients are determined by the width and the spacing of corresponding waveguides, and that the claimed transmission coefficients are achieved by adjusting the width and spacing to produce substantially maximized coupling between corresponding waveguides".

- IV. In a communication pursuant to Article 11(1) RPBA, dated 28 July 2005 and accompanying the summons to oral proceedings scheduled on 9 December 2005, the board expressed its provisional opinion that claims 1 and 4 were objectionable under Article 84 EPC.

With respect to the first aspect addressed by the appellant, the routing device shown in Figure 1 was disclosed on page 4, line 20 to page 6, line 11 of the description. On page 5, lines 18 and 19 reference was made to Figure 2 which showed the typical behaviour of this routing device, furthermore on (original) page 6, lines 13 to 23. According to the subsequent paragraph on this page 6, the routing device shown in Figure 3 ("constructed in accordance with the present invention") was composed of two frequency routing devices 10 and 12 such as shown in Figure 1. In the sentence running from lines 19 to 22 on page 7 it was stated "Moreover, the routing devices 10 and 12 are configured so that adjacent ones of each of the passbands overlap, such as indicated in Fig. 2" (on page 7 submitted with the letter of 5 December 2001 corrected into "Fig. 4"). Therefore, apparently, some measures had been taken for the device shown in Figure 1 in order to modify its transmission behaviour. However, the board could not find any information in the context of cited pages 4 to 6 as to in which aspect the prior art device would have to be modified, the only mentioning of the optical grating 32 being on page 5, lines 1 to 6, which merely described its basic structure.

In particular no teaching could be found that the spacing and/or width of the waveguides 32 would have to be adapted, as argued by the appellant. Furthermore, it was not apparent to the board that "the skilled person would readily understand which parameters are to be adjusted". This statement of the appellant was interpreted that the modification would merely imply basic textbook knowledge, however, no references to a textbook being given. In any case the only references

to prior art literature in the patent application, US Patent Nos. 5,002,350; 5,136,671 and 5,412,744 (mentioned as application Serial 238,074) were not helpful in this aspect. In US'350 it was disclosed to strongly couple the waveguides to one another at their respective ends and to uncouple them therebetween in order to improve the efficiency of the device. US'671 disclosed the optimisation of a router device similar to the one shown in Figure 1 of the present patent application (and, according to page 7, line 1 used as the devices 10 and 12); the result of this optimisation was illustrated in Figure 4, wherein the transmission was shown with the smallest possible channel spacing exceeding the channel width by a factor 1.7. It would appear that at the crossing points for two consecutive curves q and $q+1$ the transmission was approximately -7 dB below the maximum, which was not in accordance with the behaviour schematically shown in Figure 4 and expressed in condition (2). Finally in document US'744 (which was not prepublished) a solution was disclosed to obtain a router with a substantially flat passband. To this aim two adjacent input or output waveguides were combined by a Y-coupler. Therefore, in particular this reference, not being prepublished and therefore not representing a generally accessible knowledge, showed that in order to obtain a flat passband the prior art router would have to be modified substantially (namely, reducing the number of input or output waveguides with a factor two).

Therefore, it appeared that claims 1 and 4 were objectionable under Article 84 EPC, because, having regard to the description where the only enabling embodiment was for an optical apparatus in which the

- first router was a Mach-Zehnder device (Figures 7 - 10), their subject-matter was too broad and not supported by the description.
- V. With a letter received 7 November 2005 and a subsequent letter of 8 November 2005 the appellant filed four sets of claims corresponding to first to fourth auxiliary requests. In the letter of 7 November 2005 the wording of independent claims 1 and 4 of the set of claims then on file was reproduced, and, according to the appellant, "the claims currently on file are maintained as Primary Request". The appellant announced that it would not be attending the oral proceedings set for 9 December 2005. Instead, it was requested that the oral proceedings be cancelled and that the procedure be continued in writing. Furthermore, if this was not possible, that a written decision "based on the papers" was issued.
- VI. The wording of independent claim 1 of the main request (the request on which the statement of grounds of appeal was based) reads as follows:
- "An optical apparatus comprising:
- a first frequency routing device having at least one input port and P output ports, where $P \geq 2$;
 - a second frequency routing device having at least P input ports and at least one output port; and
 - P optical paths coupling the input port of the first frequency routing device to the output port of the second frequency routing device;
- wherein the optical paths each have a transmission coefficient substantially equal to unity at a distinct optical wavelength, each of said transmission coefficients being substantially equal to one half

unity at an intermediate wavelength approximately halfway between adjacent ones of said distinct optical wavelengths".

The wording of independent claim 4 of the main request reads as follows:

"An optical apparatus comprising:

 a first frequency routing device having at least one input port and P output ports, where $P \geq 2$;

 a second frequency routing device having at least P input ports and at least one output port; and

P optical paths coupling the input port of the first frequency routing device to the output port of the second frequency routing device;

 wherein the optical paths each have a transmission coefficient equal to a maximum value at a distinct optical wavelength, and each pair of adjacent optical paths produces a transmission coefficient having a minimum value at an intermediate wavelength approximately halfway between [sic] adjacent ones of said distinct optical wavelengths".

Claims 2, 3 and 5 - 18 of this request are dependent claims. It is noted that the wording of claims 1 and 4 reproduced in the letter of 7 November 2005 ("primary request") differed in that in these claims the condition for the output ports read " $P = 2$ " instead of " $P \geq 2$ ". Furthermore in claim 4 the last feature read that "the transmission coefficient (should be) substantially equal..." (emphasis added). However, since, according to the appellant, the earlier set of claims was maintained, it is assumed that these differences are based on transcription errors.

The wording of independent claim 1 of the first auxiliary request (of 8 November 2005) reads as follows:

"An optical apparatus comprising:

 a first frequency routing device having at least one input port and a plurality of output ports,

 a second frequency routing device having a plurality of input ports and at least one output port;
said optical apparatus characterized in that:

 a plurality of optical waveguides respectively couple an individual output port of the first frequency routing device to an individual input port of the second frequency routing device; and

 wherein each one of the plurality of optical waveguides exhibits substantially the same group delay characteristic".

Claims 2 to 4 of this request are dependent claims.

The wording of independent claim 1 of the second auxiliary request (of 7 November 2005) reads as follows:

"An optical apparatus comprising:

 a first frequency routing device having at least one input port and a plurality of output ports,

 a second frequency routing device having a plurality of input ports and at least one output port;

 a plurality of optical waveguides, each one of said waveguides respectively optically coupling an individual output port of the first frequency routing device to an individual input port of the second frequency routing device; and

wherein each one of the plurality of optical waveguides exhibits substantially the same group delay characteristic".

Claims 2 to 4 of this request are dependent claims.

The wording of independent claim 1 of the third auxiliary request (of 7 November 2005) reads as follows:

"An optical apparatus comprising:

 a first frequency routing device having at least one input port and a plurality of output ports,

 a second frequency routing device having a plurality of input ports and at least one output port; said optical apparatus characterized in that:

 a plurality of optical waveguides respectively couple an individual output port of the first frequency routing device to an individual input port of the second frequency routing device; and

 wherein each one of said frequency routing devices is modified in such a manner that the maximum power of an input signal applied to an input port of the frequency routing device is transmitted to an output port of that device".

Claims 2 to 4 of this request are dependent claims.

The wording of independent claim 1 of the fourth auxiliary request (of 8 November 2005) reads as follows:

"An optical apparatus comprising:

 a first frequency routing device having at least one input port and a plurality of output ports, each

one of said output ports having associated with it a wavelength of maximum transmission,

a second frequency routing device having a plurality of input ports and at least one output port, each one of said input ports having associated with it a wavelength of maximum transmission;

said optical apparatus characterized in that:

a plurality of optical waveguides respectively couple an individual output port of the first frequency routing device to an individual input port of the second frequency routing device wherein the input port and the output port so coupled have the same wavelength of maximum transmission; and

wherein each one of the plurality of optical waveguides exhibits substantially the same group delay characteristic; and" [sic].

Claims 2 and 3 of this request are dependent claims.

VII. The further arguments of the appellant in the letter of 7 November 2005 may be summarised as follows:

In the communication dated 28 July 2005 it was noted by the board that the apparatus defined in claims 1 and 4 of the main request includes two frequency routing devices such as that shown in Figure 1, and that such frequency routing devices *typically* exhibit a non-overlapped passband like that shown in Figure 2. However, it was also recognized that the two frequency routing devices employed by the apparatus of the instant application are configured so that adjacent ones of each of the passbands overlap, such as those indicated by Figure 4. Consequently, the board correctly concluded that some measures have been taken

so that the device shown in Figure 1 exhibits the desired transmission behaviour. Notwithstanding that correct conclusion, the board was nevertheless unable to ascertain which aspect(s) of the Figure 1 frequency routing device would have to be modified to impart this desired behaviour.

In accordance with the teachings of the present invention, the design conditions that must be satisfied by both of these individual frequency routing devices are those given on pages 9 and 10 of the application. As noted, there are essentially three conditions which must be satisfied, namely conditions (1) and (2) on page 9 and the condition of constant optical path (equal phase) of page 10. The relationship between conditions (1) and (2) and the waveguide spacing that is needed to produce the behaviour shown in Figure 4 simply requires a strong overlap between the adjacent coefficients of each device.

The applicant maintains that it would be readily known by those skilled in the art that to accomplish this behaviour, the channel spacing S depicted in Figure 2 must be substantially reduced. Stated alternatively, since the channel spacing is known to be a function of the waveguide spacing, the desired behaviour(s) may be realized by reducing the waveguide spacing until conditions (1) and (2) on page 9 are satisfied. Stated still another way, only a small gap may exist between two adjacent waveguides. These details, for the case where $P = 2$, are disclosed on pages 13 and 17 of the application. Given these repeated assertions by the applicant that the skilled person would readily understand which parameters are to be adjusted, the

board notes that if such modifications would merely require basic textbook knowledge, it may raise the question(s) of whether such a modification to the prior art would involve an inventive step. The answer is that it would. Recall once again that it is not a single, modified frequency router that is being disclosed and claimed in the instant application to achieve the wide and flat passband, rather it is the combination of two modified frequency routing devices optically connected in series, with prescribed transmission coefficients that produce the desired and claimed apparatus. Accordingly, this combination does represent an inventive step(s) over the prior art.

The applicant has provided additional sets of claims, which do not suffer those infirmities identified by the stated and subsequently maintained objections.

In particular, the first and second auxiliary request claim sets recite structures including two frequency routers optically interconnected by a plurality of waveguides. The waveguides so coupling exhibit substantially the same group delay. The applicant notes that the application as filed clearly recites how these equivalent group delay(s) are achieved on page 10 of the application as filed.

The third auxiliary request claim set recites structures including two frequency routing devices - modified so that they transmit the maximum power of an input signal - optically interconnected by a plurality of waveguides. The waveguides so coupling exhibit substantially the same group delay. The applicant submits that one skilled in the art would clearly

recognize and understand that to achieve maximum power transmission, any gap(s) between waveguides would have to be minimized thereby minimizing loss(es) caused by those gap(s).

Finally, the fourth auxiliary request claim set recites structures having further distinguishing characteristics over those recited in the first three sets of alternative claims.

Accordingly, the applicant submits that each of these sets of alternative claims overcome any stated objections and rejections and are therefore allowable in their present form.

VIII. Oral proceedings took place on 9 December 2005 in the absence of the appellant. The board gave its decision at the end of the oral proceedings.

Reasons for the Decision

1. The appeal is admissible.
2. *Main request*
 - 2.1 The arguments submitted by the appellant in the letter of 7 November 2005 in favour of the main request are not found persuasive for the following reasons. The appellant refers to the three design conditions on pages 9 and 10 of the original description that must be satisfied by both of the routing devices (conditions (1) and (2) and the condition that the optical paths must exhibit the same optical length). However, in the

opinion of the board, conditions (1) and (2) do not define any design condition but rather, as already objected in the decision under appeal, reproduce the desired transmission behaviour as shown in Figure 4. In particular the appellant has not shown any conclusive passages from the original disclosure nor presented any relevant evidence from textbooks from which the skilled person would have learned that, in order to modify the prior art router device shown in Figure 1 having the transmission shown in Figure 2 in the way desired, the spacing and/or width of the waveguides would have to be modified.

- 2.2 The board agrees that on pages 13 and 17 a device is disclosed with desired transmission characteristics. This device, however, is the particular router device disclosed in the context of the 2nd embodiment, i.e. the Mach-Zehnder device illustrated in Figures 7 to 10 (as was pointed out in point 4 of the board's communication of 28 July 2005).
- 2.3 Since independent claims 1 and 4 seek protection for an optical apparatus comprising frequency routing devices not limited to Mach-Zehnder devices and since the description does not disclose in which way a prior art router device would have to be modified for obtaining the desired transmission behaviour claims 1 and 4 are objectionable under Article 84 EPC.
- 2.4 Therefore the main request is not allowable.

3. *The auxiliary requests*

3.1 In its communication of 28 July 2005 the board had raised objections against the features in claims 1 and 4 (see Sections IV and 2.1 supra) which equally had been found objectionable in the decision of the examining division (Section II supra). Since this issue appeared crucial the board issued a summons to attend oral proceedings of its own motion for procedural economy.

3.2 In its letter of 8 November 2005 the appellant announced that it would not be attending the oral proceedings and filed four sets of claims corresponding to first to fourth auxiliary requests.

3.3 According to Article 10b(1) of the Rules of Procedure of the Boards of Appeal (RPBA), any amendment to a party's case after it has filed its grounds of appeal or reply may be admitted and considered at the board's discretion. The discretion shall be exercised in view of inter alia the complexity of the new subject-matter submitted, the current state of the proceedings and the need for procedural economy.

3.4 Furthermore Article 10b(3) RPBA states that amendments sought to be made after oral proceedings have been arranged shall not be admitted if they raise issues which the board (...) cannot reasonably be expected to deal with without adjournment of the oral proceedings.

3.5 With respect to the auxiliary requests the following is noted:

- 3.5.1 According to the appellant, the first and second auxiliary requests define apparatuses comprising two frequency routers optically interconnected by a plurality of waveguides, which exhibit substantially the same group delay. For the support in the description reference was made to page 10.
- 3.5.2 Page 10, lines 4 and 5, and furthermore line 10, indeed addresses the transmission lines $14_1, 14_2, \dots, 14_p$ which should have transmission coefficients with the same group delay. These transmission lines, however, are disclosed to be part of the routing arrangement shown in Figure 3, which should have a flat passband (page 10, line 1). In the original application no disclosure could be found for a structure now defined in claim 1 of the first or second auxiliary request, without simultaneously fulfilling the condition of the transmission defined in claims 1 and 4 of the main request. Therefore the subject-matter of the independent claims of the first and second auxiliary requests is broader than that of the claims of the appellant's main request and it appears highly doubtful whether the subject-matter defined in claims 1 of the first and second auxiliary requests meets the requirement of Article 123(2) EPC. Furthermore, even if it were disclosed and if no further objection pertaining to lack of support by the description arose (Article 84 EPC), it would appear doubtful whether this subject-matter would have been covered by the European search report, since the above mentioned features of the original independent claims are no longer part of the respective independent claims.

3.5.3 Therefore the claims according to the first and second auxiliary request raise a number of new and complex issues. Since their subject-matter is broader than that of the main request (which corresponded to the claims addressed in the decision under appeal) it is even questionable whether these claims may be seen as a fair attempt to overcome the prior objections. In any case the board could not see a possibility to deal with these issues without adjournment of the scheduled oral proceedings, which it decided against out of reasons of procedural economy. Therefore these requests were not admitted.

3.5.4 Claim 1 of the third auxiliary request defines an optical apparatus comprising routers modified so that these transmit the maximum power of an input signal.

In its letter of 7 November 2005 the appellant has not indicated the passages in the original application documents disclosing these features, and the board could not identify any: the only discussion of transfer of power found was in the context of the Y-branch waveguides of a Mach-Zehnder apparatuses (page 13, line 23; and claim 7), which devices are not defined on claim 1 of the third auxiliary request. Therefore this request could not be admitted, either.

3.5.5 Claim 1 of the fourth auxiliary request is apparently incomplete: both the claim filed with the letter of 7 November 2005 as well as the one filed with the letter of 8 November 2005 end with the expression "...wherein each one of the plurality of optical waveguides exhibits substantially the same group delay characteristic; and". Therefore, in addition to the

objections raised in the context of claim 1 of the first and second auxiliary request *supra* which similarly apply to claim 1 of this request, the claim wording is not clear in itself.

3.5.6 Therefore none of the auxiliary requests is admissible. Since the applicant's further request to continue the procedure in writing would have caused a further considerable delay in the procedure, this being not conform with the provisions of Articles 10b RPBA, this request must be refused.

4. Since neither request is allowable, the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

P. Martorana

A. Klein