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**Datasheet for the decision  
of 5 September 2011**

**Case Number:** T 1785/08 - 3.4.01

**Application Number:** 99935240.4

**Publication Number:** 1095422

**IPC:** H01Q 1/24

**Language of the proceedings:** EN

**Title of invention:**  
Printed twin spiral dual band antenna

**Applicant:**  
Telefonaktiebolaget L M Ericsson (publ)

**Opponent:**  
-

**Headword:**  
-

**Relevant legal provisions:**  
-

**Relevant legal provisions (EPC 1973):**  
EPC Art. 54, 56

**Keyword:**  
-

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 1785/08 - 3.4.01

**D E C I S I O N**  
of the Technical Board of Appeal 3.4.01  
of 5 September 2011

**Appellant:** Telefonaktiebolaget L M Ericsson (publ)  
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**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 14 March 2008  
refusing European patent application  
No. 99935240.4 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 European patent application No. 99935240.4 (European publication number 1 095 422; International publication number WO-A-00/03452) was refused by the examining division which, in its decision dispatched on 14 March 2008, held that the claimed invention in the application then on file did not meet the requirements of Article 52(1) and 56 EPC 1973.
- II. The examining division considered the following prior art documents:
- (D1) EP-A-0 590671;
  - (D2) K.-L. Wong and K.-P. Yang, "*Modified planar inverted F antenna*", *Electronics Letters*, Vol. 34, No. 1, 8 January 1998, pages 7 and 8, XP-000773604.
- III. The applicant (appellant) lodged an appeal, received on 7 May 2008, against the decision of the examining division. The appeal fee was paid on 8 May 2008. The statement setting out the grounds of appeal was received on 11 July 2008.
- IV. The appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the following documents:
- Claims 1-10 filed with a letter of 22 August 2011,
  - Description pages 1-4 and 10 of the published application,
  - Description pages 5-9 filed with the letter of 22 August 2011,
  - Drawings sheets 1/7-7/7 of the published application.

V. The wording of claim 1 reads as follows:

*"A dual-band built-in antenna (250) for a radio communication device (200), said antenna (250) comprising:*

- (a) a ground plane;*
- (b) two printed spiral arms (305, 310) connected at a joint connection point to a feeding pin (325), the two printed spiral arms (305, 310) having different lengths, and each of which is tuned to a different frequency band;*
- (c) a matching bridge (330) positioned between the feeding pin (325) and a ground post (335) for matching an input impedance of said antenna (250); and*
- (d) a loading resistor (560) attached to the matching bridge (330) for enhancing a bandwidth of the antenna (250)."*

The wording of independent claim 7 reads as follows:

*"A communication device (200) for use in a radio communication system, said device comprising:*

- (a) a microphone opening (220) for allowing the communication device (200) to receive auditory information from a user;*
- (b) a speaker opening (230) for allowing the communication device (200) to transmit auditory information to said user;*
- (c) a keypad (240); and*
- (d) an antenna according to any one of the preceding claims."*

Claims 2-6 and 8-10 are dependent claims.

VI. The revised version of the European Patent Convention or EPC 2000 entered into force on 13 December 2007. In the present decision, reference is made to "EPC 1973" or "EPC" for EPC 2000 (EPC, Citation practice, pages 4-6) depending on the version to be applied according to Article 7(1) of the Revision Act dated 29 November 2000 (Special Edition No. 1 OJ EPO 2007, 196) and the decisions of the Administrative Council dated 28 June 2001 (Special Edition No. 1 OJ EPO 2007, 197) and 7 December 2006 (Special Edition No. 1 OJ EPO 2007, 89).

### **Reasons for the Decision**

1. The appeal is admissible.
2. The Board has no reason to object to any of the amendments to the present application under Article 123(2) EPC.
3. The examining division held that the claimed invention in the application underlying the decision under appeal did not involve an inventive step having regard to D1 in the light of D2 (decision under appeal, II.2.5).
4. Document D1
  - 4.1 D1 pertains to a portable radio communication device with improved antenna radiation efficiency and wide bandwidth.

An object of the invention according to D1, which is of interest for the present case, is to provide a portable radio communication device capable of eliminating the

deterioration of the radiation efficiency due to the occurrence of dual resonance on the antenna, without reducing the bandwidth (column 6, lines 34-39).

This object is achieved according to one aspect of the invention of D1 by a radio communication device comprising, inter alia, an antenna formed by first and second strip-like conductor elements which are connected together at a feeding point, the first and second strip-like conductor elements having the same electrical length (column 6, lines 46-57). Another aspect of the invention of D1 concerns a method of constructing such a radio communication device (column 7, lines 1-14).

D1 discloses a first embodiment (column 10, line 41 to column 12, line 55; Figures 6-13), a second embodiment (column 12, line 56 to column 16, line 11; Figures 14-17E) and a third embodiment (column 16, line 12 to column 17, line 37; Figure 18). According to each of these embodiments, the antenna comprises first and second strip-like conductor elements with the same electrical length so that the occurrence of dual resonance can be prevented, without reducing the bandwidth (column 12, lines 50-55; column 16, lines 6-11; column 17, lines 32-37).

D1 also discloses various configurations for further improving the performance of the portable radio communication device (column 17, line 38 to column 21, line 58; Figures 19A-31B). Some of these configurations concern impedance matching and bandwidth widening (column 18, lines 1-11; column 18, lines 44-53; column 19, lines 31-47; column 21, lines 33-39).

Moreover, D1 discloses various configurations for reducing the interaction of the antenna of the portable radio communication device with the user's body (column 22, line 1 to column 29, line 50; Figures 32-50).

However, it should be noted that all the various configurations mentioned above are disclosed in the general context of the radio communication device according to column 6, lines 46-57 and also in the more detailed context of said three embodiments. In other words, the antenna of the radio communication device of D1 without exception comprises two strip-like conductor elements having the same electrical length so that the occurrence of dual resonance is prevented. This is indeed the overall teaching of the description of D1, which is consistent with the subject-matter of independent claims 1 and 20.

- 4.2 The arguments of the examining division concerning the disclosure of D1 in the decision under appeal are not convincing.

The examining division essentially held with regard to the embodiment of Figures 14-16 that *"an intentional perturbation is introduced which causes the electrical length of the arms to change and to become different to one another"* (decision under appeal, III.2.2). Moreover, *"the antennas (in isolation) disclosed in D1, figs. 15A, 16B-16D would be recognised by the skilled person as antennas of which the two radiating arms are tuned to a different frequency band, as claimed, simply because of the fact that the electrical length of both arms is different"* (decision under appeal, III.3.2).

This finding appears to be in disagreement with the explicit disclosure of D1. According to the second embodiment of D1 (column 13, line 50 to column 14, line 8; Figure 15A), as cited by the examining division, *"the short-circuit line 27a and the feeder 27b are located along a line displaced from a central line "a" of the strip-like conductor element by a distance "b", such that the physical lengths from the feeder 27b to a free end 26a of the first strip-like conductor element 25a and a free end 26b of the second strip-like conductor element 25b are different but the electrical lengths of the first and second strip-like conductor elements 25a and 25b are equal to each other. Consequently, in this configuration of Fig. 14, the occurrence of the dual resonance on this spiral shaped antenna 25 can be prevented, and therefore the deterioration of the radiation efficiency due to the occurrence of the dual resonance can be eliminated."* Moreover, *"there are various manners of adjusting the electrical lengths of the first and second strip-like conductor elements 25a and 25b to be equal to each other that can be utilized in this second embodiment"* (column 14, lines 41-46), wherein *"the adjustment of the electrical lengths can be achieved by making the physical shapes of the first and second strip-like conductor elements 25a and 25b to be different"* (column 14, line 56 to column 15, line 1). Figures 16A-17E all give examples of manners of adjustment of the electrical lengths within the meaning given in column 14, lines 41-45, i.e. *"to be equal to each other"*. In any case, the result is that *"according to this second embodiment, it also becomes possible to provide a portable radio communication device capable*



*of eliminating the deterioration of the radiation efficiency due to the occurrence of the dual resonance on the antenna, without reducing the bandwidth"*  
(column 16, lines 6-11).

Concerning the argument presented under point III.2.2 of the contested decision, the fact that different capacitive loads at the tip end of an antenna can cause a difference in the electrical length of the antenna means that the electrical lengths of the arms themselves (not taking then capacitive characteristics of the respective tip portions into consideration) will have to be different so that when the capacitive characteristics are involved, the electrical lengths of each of the antennas in combination with the ground plate will be equal. The Board is of the opinion that the teaching of D1 is so focussed on ensuring that the electrical lengths of the antennas are the same such that dual-resonance may be avoided, that the skilled person would simply understand the embodiments of Figures 14 to 16 of D1 as teaching that the total electrical lengths of the antennas must be the same. To read D1 in a different sense, namely that the antennas (in isolation) are tuned to different frequencies, would be relying too heavily on hindsight and would represent an attempt to extract desired information from the disclosure despite the fact that a fair and balanced reading does not suggest such an interpretation.

Hence, the argumentation of the examining division appears to rely on a targeted search for implicit information in D1 having knowledge of the present claimed invention. However, features or effects which the skilled person would consider to be in disagreement

with the aim and teaching of D1 should be disregarded as amounting to an ex post facto analysis.

In the Board's view, what is relevant for assessing inventive step is the technical teaching disclosed by D1 as a solution for achieving the aim of eliminating the deterioration of the radiation efficiency due to the occurrence of dual resonance on the antenna, without reducing the bandwidth. In this respect, the examining division itself agreed in the decision under appeal (III.3.2, first sentence) that the mentioned aim according to D1 differs from that underlying the present application, which consists, according to the appellant, in the provision of a small built-in antenna capable of being tuned to two frequency bands (grounds of appeal, page 8, 6.4.3.1(a)).

5. Document D2

5.1 D2 relates to a modified planar inverted F antenna which is compact and has a wide bandwidth. The reduction in antenna length is achieved by providing a meandered radiating patch, while the enhanced bandwidth with low antenna height is obtained using a chip-resistor load in place of the shorting post.

5.2 Considering the further aim underlying the present application, which consists, according to the appellant, in enhancing the resonance bandwidth (grounds of appeal, page 8, 6.4.3.1(b)), the examining division held "*the solution to this problem is well-known to the person skilled in the art: a loss is introduced inside the resonance circuit, which inherently lowers the quality factor, and consequently broadens the bandwidth. See*

*for example the document D2*" (decision under appeal, II.2.3 and II.2.4).

This may be. However, D2 does not disclose an antenna comprising two printed spiral arms connected at a joint connection point to a feeding pin, having different electrical lengths, and each of which is tuned to a different frequency band. Moreover, D2 does not disclose a loading resistor attached to a matching bridge positioned between the feeding pin and a grounded post. In view of this, D2 taken alone would not anticipate or render obvious the subject-matter of present claim 1. Moreover, a combination of D1 and D2 would not lead to the subject-matter of claim 1 because of the essential differences mentioned above between D1 and present claim 1.

6. In view of the foregoing, the subject-matter of claim 1 is novel (Article 54(1),(2) EPC 1973) over D1 and D2 and involves an inventive step (Article 56 EPC 1973) having regard to these documents, each taken alone or in combination with the other. The other prior art documents on file do not appear to come closer to the claimed invention.

The same conclusion applies to the independent claim 7 concerning a communication device comprising an antenna according to claim 1.

**Order**

**For these reasons it is decided that:**

The decision under appeal is set aside.

The case is remitted to the examining division with the order to grant a patent with the following documents:

- Claims 1-10 filed with a letter of 22 August 2011,
- Description pages 1-4 and 10 of the published application,
- Description pages 5-9 filed with the letter of 22 August 2011,
- Drawings sheets 1/7-7/7 of the published application.

The Registrar

The Chairman:

R. Schumacher

B. Schachenmann