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D E C I S I O N
of 17 November 1999

Case Number: T 0999/98 - 3.5.1

Application Number: 89307087.0

Publication Number: 0355973

IPC: H04B 1/48

Language of the proceedings: EN

Title of invention:
Digital mobile phone

Patentee:
Nokia Mobile Phones Ltd.

Opponent:
Robert Bosch GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 52(1), 56

Keyword:
"Inventive step (no)"

Decisions cited:
-

Catchword:
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Boards of Appeal

Chambres de recours

Case Number: T 0999/98 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 17 November 1999

Appellant: Nokia Mobile Phones Ltd.
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Representative: -

Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 30 July 1998
revoking European patent No. 0 355 973 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: P. K. J. van den Berg
Members: A. S. Clelland
P. H. Mühlens

Summary of Facts and Submissions

I. This appeal is against the decision of the Opposition Division to revoke European patent No. 355 973 on the ground that the subject-matter of independent claim 1 lacked an inventive step having regard to the disclosure of the following documents:

E1: EP-A-0 085 180,

E2: Electronic Letters, Vol. 20, No. 1, Jan 1984, pages 25-27; J. K. Gautam et al. "Novel realisation of an automatic transmit-receive switch and two bandpass filters by a single saw filter.", and

E3: US-A-4 754 450.

II. The appellant (patentee) lodged an appeal against this decision and requested that the decision be cancelled and the patent maintained as granted. Oral proceedings were requested prior to any decision not meeting the appellant's request in full. In a written statement setting out the grounds of appeal the appellant argued that the claims of the granted patent were inventive.

III. The respondent (opponent) implicitly requested that the appeal be dismissed and maintained the argument that the subject-matter of claim 1 lacked an inventive step having regard to the documents cited above; an auxiliary request for oral proceedings was made.

IV. Oral proceedings were held before the Board on 17 November 1999. In the course of the oral proceedings

the appellant filed an auxiliary request based on a combination of claims 1 and 3 of the granted patent. Claim 1 of the main request reads as follows:

"A digital mobile phone based on time-division multiplexing (TDM), including an antenna, a receiver input (R) for receiving signals during a first time interval and on a first frequency, and a transmitter output (T) for transmitting signals during a second time interval, different from the first time interval, and on a second frequency, different from the first frequency, **characterized** in that a duplex type filter (S), having a reverse attenuation from the transmitter output (T) to the receiver input (R) less than 60 dB, is used to couple the antenna to said receiver input (R) and transmitter output (T)."

V. Claim 1 of the auxiliary request reads as follows:

"A digital GSM mobile phone based on time-division multiplexing (TDM), including an antenna, a receiver input (R) for receiving signals during a first time interval and on a first frequency, and a transmitter output (T) for transmitting signals during a second time interval, different from the first time interval, and on a second frequency, different from the first frequency, **characterized** in that a duplex type filter (S), having a reverse attenuation from the transmitter output (T) to the receiver input (R) of the order of 40 dB, is used to couple the antenna to said receiver input (R) and transmitter output (T)."

VI. The arguments of the parties are discussed in the Reasons for the Decision.

Reasons for the Decision

1. *Background to the invention*

1.1 In mobile phone systems it is standard practice for the transmitter and receiver to be connected to a single antenna. In earlier analogue mobile phones this was effected by means of a duplexer which served to present a low impedance between the transmitter and antenna at the transmitting frequency, whilst presenting a higher impedance between receiver and antenna at this frequency so that the transmitted energy could not reach the receiver; the reverse was true for the reception frequency, so that received energy was passed to the receiver rather than the transmitter. Such a system can be considered as a form of frequency division multiplexing.

1.2 With the introduction of digital mobile phones based on the GSM system it was discovered that because the system was time-division multiplexed it was advantageous to use a high-speed switch to connect the antenna to either the receiver or transmitter in accordance with the assigned time slots instead of a duplexer. The Board has no reason to doubt the appellant's submission that the use of a switch resulted in a lighter and cheaper mobile phone, a cost penalty of 10% for a duplexer being mentioned. The only kind of duplexer available at the claimed priority date was stated by the appellant to be the known analogue duplexer which provided a reverse attenuation of greater than 60 dB, i.e. the transmitted signal as seen

at the receiver input was attenuated by this figure.

1.3 It was common ground between the parties that the single most relevant document was E3, which at Figure 4 disclosed a digital mobile phone based on time-division multiplexing and having the features of the preamble of claim 1. Figure 4 provides a switch 418, as discussed above, which couples either the transmitter or the receiver to the antenna. Although this is the preferred embodiment it can be seen from column 6, lines 21 to 24 of E3 that the switch 418 "could be replaced with a duplexer (or the like) to continually couple the transmitter and receiver to the antenna".

1.4 It was argued by the appellant that there was a strong technical prejudice against using a duplexer because of the above-mentioned cost and weight penalty.

2. *Inventive step (main and auxiliary requests)*

2.1 The Board considers that both requests can be considered together since the conclusions below on the main request apply equally to the auxiliary request.

2.2 The appellant's argument is in essence that at the claimed priority date the skilled person had two possibilities for connecting transmitter and receiver to antenna in a TDM mobile phone, namely a high-speed switch or a duplexer, the former being strongly preferred. The inventor realised however that the existing duplexers were over-engineered for a TDM system and made the surprising discovery that a smaller filter with lower reverse attenuation could be used as the duplexer. It was argued that a third class of

device thereby became available, namely a lower attenuation duplexer optimised for TDM systems. There was no suggestion in any of the prior art that such filters either existed or were considered desirable. Indeed, the prior art pointed towards a much higher attenuation than the limit of 60 dB claimed. E2 for example suggested a theoretical reverse attenuation of 120 dB and a practical result of 65 to 70 dB, although the document was somewhat unclear, whilst E1 chained two separate filters to give an attenuation of greater than 80 dB. It was therefore clear that there was no suggestion in any of the prior art that a filter with a lower attenuation could and should be provided.

2.3 The Board agrees that the correct starting point for a consideration of inventive step is the Figure 4 embodiment of E3 as modified by the text to provide a duplexer. The correct question to be answered, in the Board's view, is therefore how the skilled person would set about providing a suitable duplexer for such a mobile phone.

2.4 The Board does not accept that the skilled person would automatically reach for an available duplexer for an analogue mobile phone. Given the constant pressure in the mobile phone industry for both miniaturisation and cost reduction it is to be expected that careful thought would be given to the operating parameters of any component to be used in such a phone. Once the skilled person started to investigate what properties would be necessary were he to use a duplexer in the E3 mobile phone, it would immediately become apparent that because transmission and reception do not take place simultaneously in a TDM system the requirements on the

duplexer are less rigorous than for an analogue duplexer. The Board sees no reason to doubt the appellant's assertion that analogue duplexers require a reverse attenuation of the order of 60 to 70 dB whereas for TDM duplexers an attenuation of the order of 40 dB suffices. It is therefore the Board's view that once the skilled person, under pressure to minimise size and cost, poses the question of what properties a duplexer must have for use in a TDM system he will inevitably arrive at a filter having the claimed properties, i.e. an attenuation substantially less than the at least 60 dB used in analogue duplexers.

2.5 In essence, this is the reasoning on which the Opposition Division found claim 1 lacking an inventive step. Although the appellant argued that the Opposition Division had used hindsight and had misapplied the problem-and-solution approach, this argument assumes a fixation on the part of the skilled person on an existing analogue duplexer. The Board can see no reason why this should have been true, given that the art was a new art making use of a TDM protocol and thus quite different to the existing analogue systems. Although the Board accepts that the skilled person would have been prejudiced against the use of such a duplexer in view of the cost and weight penalty, the presence in E3 of an alternative embodiment making use of a duplexer suggests that the prejudice was not as great as has been suggested. The appellant in fact asserted that there were in effect two technical prejudices: one against duplexers in general but, were a duplexer to be used, in favour of analogue duplexers. As will be apparent from the above discussion, the Board sees no evidence that the skilled person would have held the

latter prejudice rather than design a duplexer suitable for the purpose intended.

- 2.6 No particular merit was suggested for the provision of a reverse attenuation of the order of 40 dB; it appears from the description that this is the figure which the skilled person finds satisfactory in a TDM system. The Board accordingly concludes that the skilled person investigating the properties of a duplexer for use in Figure 4 of E3 would have developed a duplexer with the claimed properties.
- 2.7 The Board accordingly concludes that the subject-matter of claim 1 of both the main and auxiliary requests lacks an inventive step.
3. There being no other requests, it follows that the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

M. Kiehl

P. K. J. van den Berg