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Datasheet for the decision of 29 June 2017

Case Number: T 0791/13 - 3.5.03

Application Number: 00117043.0

Publication Number: 1179894

IPC: H04B7/08

Language of the proceedings: EN

Title of invention:
Front end for a mobile communication device

Patent Proprietor:
IPCom GmbH & Co. KG

Opponent:
Telefonaktiebolaget L- M Ericsson (publ)

Headword:
Front end/IPCOM

Relevant legal provisions:
EPC Art. 56, 84, 123(2)
RPBA Art. 13(3)

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It can be changed at any time and without notice.

Keyword:
Inventive step - (yes)
Claims - clarity (yes)
Late-filed request - admitted (yes)

Decisions cited:
G 0003/14

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Case Number: T 0791/13 - 3.5.03

D E C I S I O N
of Technical Board of Appeal 3.5.03
of 29 June 2017

Appellant 1: (Patent Proprietor)	IPCom GmbH & Co. KG Zugspitzstrasse 15 82049 Pullach (DE)
Representative:	Molnia, David Df-mp Dörries Frank-Molnia & Pohlman Patentanwälte Rechtsanwälte PartG mbB Theatinerstrasse 16 80333 München (DE)
Appellant 2: (Opponent)	Telefonaktiebolaget L- M Ericsson (publ) 164 83 Stockholm (SE)
Representative:	Hoffmann Eitle Patent- und Rechtsanwälte PartmbB Arabellastraße 30 81925 München (DE)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 22 January 2013 concerning maintenance of the European Patent No. 1179894 in amended form.**

Composition of the Board:

Chairman	F. van der Voort
Members:	B. Noll
	P. Guntz

Summary of Facts and Submissions

I. Opposition was filed against European patent No. 1179894 in its entirety on the ground that the subject-matter claimed lacked novelty and inventive step (Article 100(a) EPC). In its decision, the opposition division held that taking into consideration the amendments made by the proprietor during the opposition proceedings according to a second auxiliary request, the patent and the invention to which it relates met the requirements of the Convention.

II. Appeals against this decision were filed by both the patent proprietor (appellant 1), which defended the patent as granted and in amended form on the basis of six auxiliary requests, and the opponent (appellant 2).

III. In a communication accompanying a summons to oral proceedings, the board gave its preliminary view on the case, *inter alia* on claim interpretation and on novelty.

The following documents *inter alia* were referred to in the impugned decision:

E1: Carl David Todd: "The Potentiometer Handbook", McGraw Hill, New York (1975), pages v, vii-xv, 1-14 and 102-112;
E2: EP 1 014 480 A2;
E4: DE 4 321 805 A1;
E5: WO 96/08850 A2;
E8: US 3,295,138 A; and
E12: US 5,504,745 A.

IV. Oral proceedings before the board were held on 29 June 2017.

In the course of the oral proceedings, the patent proprietor filed a new request consisting of a single claim, replacing all requests previously on file. It requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of this claim.

The opponent requested that the decision under appeal be set aside and that the patent be revoked in its entirety.

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

V. Claim 1 reads as follows:

"Mobile communication device (1) comprising a front end (8), whereby the front end (8) comprises
at least two inputs, a first input (10) and a second input (11),
a phase shifter (9, 42) capable of shifting the phase of a first signal traveling through the phase shifter (9, 42) from the first input (10) to the second input (11) by a predetermined phase shift and capable of shifting the phase of a second signal traveling through the phase shifter (9, 42) from the second input (11) to the first input (10) and
a selector (20) for selecting an output signal between the first input (10) and the second input (11), characterized in that
the selector (20) is capable of selecting the output signal such that the output signal is the sum of the first signal being delayed by a phase shift between 0 and the predetermined phase shift and the second signal being delayed by a phase shift between the

predetermined phase shift and 0,
whereby the mobile communication device comprises at least two antennas, a first antenna (4) and a second antenna (5),
whereby the first antenna (4) is connected to the first input (10) of the front end,
whereby the second antenna (5) is connected to the second input (11) of the front end."

Reasons for the Decision

1. Admissibility of the request

1.1 The opponent requested that the request filed during the oral proceedings not be admitted and argued that it was late-filed and that the claim did not comply with Article 84 EPC as regards clarity and with Article 123(2) EPC.

1.2 Exercising its discretion pursuant to Article 13 RPBA, the board considered the following:

(a) The request was a response by the proprietor to the board's finding in the oral proceedings on a then pending fourth auxiliary request, which deviated from the preliminary opinion in the board's communication concerning this request.

(b) As will be further discussed in detail below, the claim is essentially a combination of granted claims and complies with Articles 84 and 123(2) EPC.

1.3 The opponent further requested that the oral proceedings be adjourned if the new request was admitted. The opponent argued that it had no proper opportunity for properly assessing compliance with

Articles 84 and 123(2) EPC and to reconsider the prior art on file. Further, it was held that a further search in the prior art was necessary.

1.4 The board did not share this view. It considered that the examination of compliance with Articles 84 and 123(2) EPC and of the grounds for opposition pursuant to Article 100(a) and (c) EPC in the course of the oral proceedings, taking into account the written submissions and the results of the discussion of the previously pending requests in the oral proceedings, did not put an undue burden on the board itself (see the points below). The board further held that examination of these issues in the course of the oral proceedings did not put an undue burden on the parties either and that the new request did not change the subject-matter claimed in a manner that a further prior-art search or reconsideration of the prior art on file was necessary.

1.5 For the above reasons, and in exercising its discretion pursuant to Article 13 RPBA, the board decided to admit the request and not to adjourn the oral proceedings.

2. *Added subject-matter (Article 123(2) EPC)*

2.1 Present claim 1 is based on a combination of all features of claims 1 to 3 and 10 to 13 as originally filed.

2.2 The opponent argued that claim 10 as originally filed, which is directed to a mobile communication device, could not serve as a basis for the subject-matter of present claim 1. It argued that claim 10 as originally filed was to be understood as seeking protection for a mobile communication device having two different phase

shifters and four inputs, since it was dependent on claim 1 as originally filed. Present claim 1, however, specified only a single phase shifter and two inputs. The opponent further argued that a clear and unambiguous basis was neither provided by Fig. 2 and the corresponding parts of the description, since Fig. 2, in contrast to Fig. 1, related to a receiver arrangement, whereas present claim 1 was directed to a mobile communication device. Further, the receiver arrangement of Fig. 2 included amplifiers, whereas the claimed mobile communication device did not.

2.3 The board does not agree.

Claim 1 as originally filed reads:

> "Front end (8) comprising at least two inputs, a first input (10) and a second input (11), and a phase shifter (9, 42) capable of shifting the phase of a first signal traveling through the phase shifter (9, 42) from the first input (10) to the second input (11) by a predetermined phase shift and capable of shifting the phase of a second signal traveling through the phase shifter (9, 42) from the second input (11)."

Claim 10 as originally filed reads:

> "Mobile communication device (1) comprising a front end (8) with *[sic]* least two inputs, a first input (10) and a second input (11), in particular a front end (8) according to one of the foregoing claims, characterized in that the front end (8) comprises a phase shifter (9, 42) capable of shifting the phase of a first signal traveling through the phase shifter (9, 42) from the first input (11) to the

second input (11) by a predetermined phase shift and capable of shifting the phase of a second signal traveling through the phase shifter (9, 42) from the second input (11)."

In the board's judgement, it would be immediately apparent to the skilled reader that in claim 10 as originally filed the wording "in particular a front end (8) according to one of the foregoing claims" refers to one example of the front end referred to at the beginning of claim 10 ("Mobile communication device (1) comprising a front end (8)") and that the remaining wording is a repetition of the wording of claim 1 as originally claimed. Hence, claim 10 seeks protection inter alia for a mobile communication device which includes a front end as defined in claim 1. For this combination, the above-mentioned repetition in wording becomes redundant and may therefore be omitted without changing the subject-matter of the claim. Present claim 1 is thus based on claims 1 to 3 and 10 to 13 as originally filed and there is no need to further consider the description as filed, in particular Fig. 2 as referred to by the opponent.

2.4 The board therefore concludes that claim 1 complies with Article 123(2) EPC.

3. *Clarity (Article 84 EPC)*

3.1 The opponent submitted that present claim 1 was not merely a combination of features of granted claims and that therefore compliance with Article 84 EPC had to be examined.

The opponent argued that claim 8 as granted specified separate inputs of the mobile communication device.

Claims 10 and 11 as granted, however, specified that the first and second antennas were connected to the first and second inputs of the front end, i.e. to different inputs. It was thus unclear whether in the presently claimed device the antennas were directly or merely indirectly connected to the front end of the mobile communication device.

3.2 Claim 1 as granted reads as follows:

> "Front end (8) comprising at least two inputs, a first input (10) and a second input (11), a phase shifter
> (9, 42) capable of shifting the phase of a first signal traveling through the phase shifter (9, 42) from the first input (10) to the second input (11) by a predetermined phase shift and capable of shifting the phase of a second signal traveling through the phase shifter (9, 42) from the second input (11) to the first input (10) and a selector (20) for selecting an output signal between the first input (10 and the second input (11), characterized in that
> the selector (20) is capable of selecting the output signal such that the output signal is the sum of the first signal being delayed by a phase shift between 0 and the predetermined phase shift and the second signal being delayed by a phase shift between the predetermined phase shift and 0."

Claim 8 as granted reads as follows:

> "Mobile communication device (1) comprising a first input (10) and a second input (11) and a front end (8) according to one of the foregoing claims."

Present claim 1 is a combination of claims 1 and 8 to 11 as granted, except that in the wording taken from claim 8 as granted "comprising a first input (10) and a second input (11)" has been deleted.

Following G 3/14 (OJ EPO 2015, 102, see the order), examination for compliance with Article 84 EPC is limited to the extent that the amendment introduces non-compliance with Article 84 EPC. In the present case, examination for compliance with Article 84 EPC is therefore limited to the question of whether a non-compliance is introduced by omitting "comprising a first input (10) and a second input (11)" from the present claim.

3.3 In the board's judgement, the skilled reader would interpret claim 8 as granted such that the first and second inputs explicitly referred to in this claim are the same first and second inputs as referred to in claim 1 as granted. In particular, he would interpret the combination of the features of claims 1 and 8 to 11 such that the antennas are connected to the first and second inputs of the front end and, hence, that the wording "comprising a first input (10) and a second input (11)" in claim 8 as granted is redundant. Omitting now this wording from the present claim does not therefore give rise to a clarity objection under Article 84 EPC, but merely does away with this redundancy in wording.

3.4 The board therefore concludes that the amendment does not introduce non-compliance with Article 84 EPC.

4. *Novelty (Articles 52(1), 54 and 100(a) EPC)*

4.1 A novelty objection based on E1 was raised in the notice of opposition against claim 1 as granted, which related to a front end. E1 is an excerpt from a textbook on electrical potentiometers. Fig. 1-1 shows a rheostat, i.e. wire-wound potentiometer having a sliding contact. E1 does not disclose a mobile communication device having first and second antennas connected to first and second inputs of the front end as claimed in the present claim.

The subject-matter claimed is therefore new having regard to E1.

4.2 E2 discloses a radio receiver for antenna diversity reception. The radio receiver is configured to direct the reception beam of a multi-element antenna array towards a desired direction by means of a phase shifter 3 (cf. the abstract and Fig. 3). The radio receiver "may be used in a mobile communication base station" (cf. paragraph [0001]) and is therefore a mobile communication device within the wording of the claim. The radio receiver has four antennas 1a to 1d (Fig. 3). Using the wording of the patent in suit, antenna 1b is considered as a first antenna, and antenna 1a as a second antenna. The E2 radio receiver further includes a block "phase shifter 3" (see Fig. 2) for adjusting the phase of signals received from the antennas, combining the signals and forwarding the combined signal towards further stages of the receiver for further signal processing, via a receiver filter 5 and a low noise reception amplifier 6 (cf. column 1, lines 11 to 27 in connection with paragraph [0016]). This "phase shifter" in E2 is therefore a front end within the wording of claim 1. It comprises at least two inputs. The first antenna 1b is connected to the first input via element feeder 2b, and the second

antenna 1a is connected to the second input via element feeder 2a. As shown in Fig. 2 of E2, the front end comprises a phase shifter, represented in Fig. 2 by a symbol "ΔΦ", provided in the signal path between the input from antenna 1b and the point at which the signal is combined with the signal from antenna 1a. Therefore, this phase shifter "ΔΦ" is capable of shifting the phase of the first signal (from antenna 1b) travelling through the phase shifter from the first input to the second input by a predetermined phase shift. The front end in E2 further includes a junction, represented in Fig. 2 by the node at which the signals from antennas 1a and 1b are combined. As regards the combination of signals, it is stated in E2 (cf. column 2, lines 5 to 17):

"Accordingly, when the phase shifter 3 synthesizes the signals received by the antenna elements in a manner such that a successively increasing phase delay, in increment of $\Delta\Phi=2\pi d\sin\theta/\lambda$, is applied to signals received by the antenna elements 1b, 1c, 1d as referenced to the signal received by the antenna element 1a, the signals received by the individual antenna elements are combined at an equal phase relative to each other to provide a maximum reception strength for the incidence of the radio wave at the angle of depression of θ, thus directing a main lobe of the antenna directivity, hereafter the [sic] *referred to as antenna beam, in the direction of the angle θ."*

The skilled reader would therefore understand that at the node the output signal is created as being the sum of the first signal delayed by a phase shift of ΔΦ and the second signal delayed by a phase shift 0, to make available a "maximum reception strength" of the signal received at the antennas at circuit stages following

the front end. The skilled reader would therefore understand that the signals from antennas 1a and 1b, after having been combined, leave the front end at the terminal towards the subsequent receiving filter.

The opponent argued that Fig. 12 of E2 showed that the phase shifter ΔΦ was only a portion of the transmission line between the second input and the point at which the first and second signals were combined and, consequently, that a signal could travel from the second to the first input and be phase-shifted between the predetermined phase shift and 0.

The board does not agree. Fig. 12 only shows a substrate on which the front end and subsequent filter stages are implemented, shown as a pattern of thin-film conductors (cf. column 9, lines 29 to 31). Fig. 12 does not however disclose further details relating to the design of the pattern from which it could have been concluded that signals travel between the first and the second inputs.

Accordingly, E2 at least does not disclose that the phase shifter ΔΦ is capable of shifting the phase of the second signal travelling through the phase shifter from the second input to the first input by a phase shift between the predetermined phase shift and 0.

4.3 E4 discloses a diversity receiver (Fig. 3) having two antennas 11, 12 and a variable phase-shift module 19 which includes two phase-shift circuits 17, 18. A signal from a first antenna 11 is fed to the first phase-shift circuit 17 and a signal from the second antenna 12 is fed to the second phase-shift circuit 18 (cf. column 7, lines 12 to 22). The output signals of the phase-shift circuits are combined at a node 20.

Thus, each phase-shift circuit 17, 18 is capable of shifting the phase of a respective signal from the respective antenna 11, 12 travelling through it by a respective predetermined phase shift.

E4 does not disclose, *inter alia*, that the phase shifter (17 or 18) is capable of shifting the phase of the first signal travelling through the phase shifter from the first input to the second input by a predetermined phase shift, and shifting the phase of the second signal travelling through the phase shifter from the second input to the first input by a predetermined phase shift.

4.4 E5, which was referred to in the opponent's statement of grounds of appeal, discloses a radio receiver arrangement for optimising a reception direction (cf. the abstract). Fig. 2 shows an arrangement having first and second antennas 3, 4. The combiner 23 and the adjustable phase shifting arrangement 24 are a "front end" within the meaning of the patent in suit (the board notes that the term "front-end" is differently used in E5 in that "receiver front-end" designates a superheterodyne receiver in which the antenna is coupled to mixers via a bandpass filter, cf. page 6, lines 4 to 7). The first and second antennas are connected to first and second inputs of the front end, i.e. antenna 3 is directly connected to combiner 23 and antenna is directly connected to the input of phase shifting arrangement 24.

E5 thus discloses a front end which is substantially similar to that of E2. Accordingly, the mobile communication device as claimed is distinguished from the arrangement of E5 by the features identified at point 4.2 above.

4.5 E8, which was discussed in the opponent's statement of grounds of appeal, discloses a phased array reception system having four antennas 10, 12, 14 and 16 (cf. Fig. 1). Each antenna is connected to a first input of a respective delay line 18, 20, 22 and 24. The output of each delay line is connected to a summing network 26. Each delay line provides a respective delay to the signal from the respective antenna such that a coherent addition of signals is achieved (cf. column 2, lines 11 to 19). Each delay line is therefore a phase shifter and the output connected to the summing network corresponds to the second input of the phase shifter within the wording of the patent in suit. E8 therefore discloses that a particular phase shifter, e.g. delay line 18, is capable of shifting the phase of the first signal, i.e. the signal from antenna 12 travelling through the phase shifter, from the first input to the second input by a predetermined phase shift. E8 further discloses that the amount of phase shift may be controlled by providing binary switched delay lines of different lengths as shown in Fig. 3, resulting in switchable signal delays of different lengths.

However, E8 does not disclose that the phase shifter, i.e. delay line 18, is capable of shifting the phase of a second signal, e.g. the signal from any of antennas 12, 14 or 16, travelling through the phase shifter from the second input, i.e. the output of delay line 18 connected to the summing network 26, to the first input, i.e. to the end of delay line 18 to which antenna 10 is connected, by a predetermined phase shift. There is no disclosure that a signal input at the summing network by a particular delay line may be output from the summing network 26 towards another delay line.

4.6 E12 discloses a device for processing RF signals in various ways, e.g. splitting a signal from one input amongst multiple outputs or combining signals from multiple inputs to a single output signal. The device has four input delay lines Ei-E'i (Fig. 1) and four output delay lines Sj-S'j (cf. column 4, lines 45 to 50). Each input line is coupled to each output line by means of a switching block 1 constituted by matrix of switching elements (transistors T_{ij}) which enable one or more input lines to be selectively connected to one or more output lines (column 5, lines 3 to 6). Since a delay line comprises two inputs, a phase shifter, i.e. the delay line itself, capable of shifting the phase of a first signal travelling through the phase shifter from the first input to the second input, e.g. from E1 to E'1, by a predetermined phase shift and capable of shifting the phase of a second signal travelling through the phase shifter from the second input to the first input, e.g. from E'1 to E1, and a selector, e.g. T_{11}, for selecting an output signal between the first input and the second input, the delay line and the switching element constitute a front end within the wording of the present claim.

E12 does, however, not disclose a mobile communication device in which a first antenna is connected to the first input of the front end and a second antenna to the second input of the front end.

4.7 The board concludes that the subject-matter of the present claim is novel having regard to the disclosure of each of documents E1, E2, E4, E5, E8 and E12.

5. *Inventive step (Articles 52(1), 56 and 100(a) EPC)*

5.1 At the oral proceedings the opponent argued lack of inventive step starting out from E2 and having regard to E12, starting out from E4 and having regard to E12, and starting out from E12 and taking into account the common general knowledge of a person skilled in the art.

5.2 Starting out from E2 as representing the closest prior art, the claimed mobile communication device differs from the device disclosed in E2 at least by the feature identified in point 4.2 above.

A technical effect achieved by the inclusion of this feature in the receiver of E2 is that both first and second signals can be delayed, whereas with the phase shifter as disclosed in E2 only the first signal is delayed.

The technical problem to be solved starting out from E2 may therefore be formulated as to improve the phase-shift capability of the front end of the mobile communication device.

5.3 The opponent argued that the skilled person would be led by E12 to consider replacing the phase shifter and the combiner of the receiver of E2 by a switching matrix cell as disclosed in E12 (cf. point 4.6 above).

5.4 The board does not agree. Even though the device disclosed in E12 may, in principle, be configured to provide the function of a front end as specified in claim 1, E12 itself does not suggest such a function. There would be no motivation for the skilled person to consider such a function of a switching matrix cell without the benefit of hindsight.

5.5 For the above reasons, the claimed mobile communication device is not rendered obvious when starting from E2 and taking into account the teaching of E12.

5.6 The opponent's line of argument when starting out from E4 was the same as that when starting out from E2.

The board holds that the considerations regarding inventive step when starting out from E4 instead of E2 are the same as set out at point 5.4 above. In particular, the phase delay circuit in E4 is, like the phase delay circuit in E2, configured to delay only the first signal (see point 4.3 above). For the same reasons as set out at point 5.4 above, the board comes to the conclusion that the claimed device is not rendered obvious when starting from E4 and taking into account the teaching of E12.

5.7 The opponent further argued that the skilled person, starting out from E12 and considering the large variety of different applications suggested in E12, namely use of the switching matrix for separating, combining, distributing and processing RF signals, including applications in the field of radars and satellites (cf. the last paragraph) and the fact that the device is designed to operate in both ways (column 1, lines 53 to 55 "both-way"), would obviously consider further applications such as a multi-array radar application, in which first and second antennas would be connected to the device of E12 such that their respective output signals would be fed at opposite inputs of a particular delay line of the device.

5.8 The board does not agree. Even though D12 suggests different applications of the device for RF signal processing, none of these applications implies that two

signals are fed at opposing inputs of one and the same transmission line of the switching matrix cell. Therefore, this argument is based on hindsight, i.e. it uses knowledge derived from the patent in suit.

5.9 The board concludes that the subject-matter of present claim 1 is not obvious having regard to the disclosure of E2 or E4 and taking into account the teaching of E12, or having regard to E12 and taking into account the common general knowledge of the person skilled in the art.

6. The board thus concludes that the grounds for opposition pursuant to Article 100(a) and (c) EPC do not prejudice the maintenance of the patent in amended form on the basis of the present claim.

Order

For these reasons it is decided that:

The decision under appeal is set aside.

The case is remitted to the department of first instance with the order to maintain the patent in amended form on the basis of claim 1 of the request filed during oral proceedings and a description to be adapted accordingly.

The Registrar: The Chairman:

G. Rauh F. van der Voort

Decision electronically authenticated