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D E C I S I O N
of 24 February 2005

Case Number: W 0039/04 - 3.5.3

Application Number: PCT/EP04/002019

Publication Number:

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Language of the proceedings: EN

Title of invention:

Antenna Switches including Field Effect Transistors

Applicant:

Telefonaktiebolaget LM Ericsson (publ)

Opponent:

-

Headword:

Antenna Switches/ERICSSON

Relevant legal provisions:

EPC Art. 155(3)
EPC R. 105(3)
PCT Art. 17(3)(a)
PCT R. 13.1, 13.2, 13.3, 40.1, 40.2

Keyword:

"Unity of invention (no)"

Decisions cited:

-

Catchword:

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Case Number: W 0039/04 - 3.5.3

International Application No. PCT/EP04/002019

D E C I S I O N
of the Technical Board of Appeal 3.5.3
of 24 February 2005

Applicant:

Telefonaktiebolaget LM Ericsson (publ)
SE-164 83 Stockholm (SE)

Decision under appeal:

Protest according to Rule 40.2(c) of the Patent Cooperation Treaty made by the applicants against the invitation (payment of additional fees) of the European Patent Office (International Searching Authority) dated 15 July 2004.

Composition of the Board:

Chairman: A. S. Clelland
Members: A. J. Madenach
C. Holtz

Summary of Facts and Submissions

- I. On 1 March 2004 the applicant filed the international patent application PCT/EP04/002019.

- II. On 15 July 2004 the European Patent Office acting as International Search Authority (ISA) issued a reasoned communication under Rule 40.1 PCT informing the applicant that it considered the international application to be in non-compliance with the requirements of unity of invention (Rule 13.1, 13.2 and 13.3 PCT) and invited the applicant to pay additional fees.

The ISA considered that the international application comprised the following two groups of inventions which were not linked together by a single inventive concept, namely:

Group 1: claims 1 to 16, 33: relating to a transceiver circuit comprising a switch for switching from transmission to reception realized using a field-effect transistor;

Group 2: claims 17 to 32, 34: relating to a transceiver circuit comprising a bias circuit and an isolation device in the transmission path of the transceiver.

The ISA argued that the technical problem associated with the first group could be seen as reducing the power consumption of the transceiver circuit whereas the technical problem associated with the second group could be seen as reducing the transmission losses caused by an isolation device in the transmission path

of the transceiver. The common technical features were a transmission amplifier and a receiver, well known parts of a transceiver, and the inventions of groups 1 and 2 shared neither the same nor corresponding special technical features. Moreover, the problems associated with the two groups of inventions were independent from each other as they did not form a linked series of problems and solutions.

- III. In response to the communication under Rule 40.1 PCT, the applicant authorized with letter of 11 August 2004 payment of an additional fee under protest.

In this letter, the applicant argued that the isolation device of the second group was included in the switching function of the first group to make it work. In particular, the MOS-switches of the first group made it possible to use PIN-diodes without power consumption in the receive mode. Moreover, a further connection between the two groups was the integration of the switch on the same chip as the transceiver. Finally, various combinations of receive and transmit bands could be activated simultaneously by the present invention.

- IV. With communication of 5 October 2004 a review panel of the ISA as provided under Rule 40.2 (e) PCT maintained the objection as to lack of unity of 15 July 2004. Payment of the protest fee as provided in the same Rule of the PCT was authorized by the applicant by letter of 19 October 2004.

- V. Independent claim 1 of the international application reads:

"A transceiver circuit comprising:

a transmission amplifier coupled with an antenna input/output node wherein the transmission amplifier is configured to amplify communications to be transmitted from the transceiver circuit;

a receiver including a receiver input coupled with the antenna input/output node; and

a field effect transistor coupled between the receiver input and an electrical reference wherein the field effect transistor is configured to provide an open circuit when receiving communications at the receiver input and wherein the field effect transistor is configured to provide a closed circuit when not receiving communications at the receiver input."

Independent claim 17 of the international application reads:

"A transceiver circuit comprising:

a transmission amplifier coupled with an antenna input/output node wherein the transmission amplifier is configured to amplify communications to be transmitted from the transceiver circuit;

a receiver including a receiver input coupled with the antenna input/output node; and

an isolation device coupled between the transmission amplifier and the antenna input/output node and between the transmission amplifier and the receiver input;

a bias circuit coupled with the antenna input/output node wherein the bias circuit is configured to provide a low impedance at the isolation device when transmitting communications from the

transmission amplifier and to provide a high impedance at the isolation device when communications are not being transmitted from the transmission amplifier."

The further independent claims 33 and 34 relate to communication devices in essence comprising transceiver circuits as claimed in claims 1 and 17 respectively.

Reasons for the Decision

1. The present protest relates to an invitation by the ISA to pay additional fees under Rule 40.1 PCT.

According to Art. 155(3) EPC and R. 105(3) EPC, the Boards of Appeal are responsible for deciding on a protest made by an applicant against an additional fee charged by the European Patent Office under the provisions of Art. 17(3) a) of the PCT.

2. The present application relates to antenna switches for switching between the transmit and receive functions in transceivers.

- 2.1 According to one feature of the application, which corresponds to the first group of inventions, a field effect transistor (FET) is used as an antenna switch for a receiver in a transceiver circuit, the FET being activated or deactivated in response to a voltage control signal in accordance with the receiving state of the transceiver circuit (page 1, line 26 - page 2, line 4; and page 3, lines 20 to 30).

Field effect transistors as antenna switches have the advantage over conventionally used PIN-diodes that they do not draw significant current (page 3, line 26 - page 4, line 5); however, they give rise to the problem that they have a limited voltage swing and are prone to parasitic coupling and capacitive effects (page 11, lines 25 to 32). This is said to be solved by the provision of a low source to drain capacitance of the FET as shown in Fig. 6, giving improved performance characteristics.

- 2.2 According to another feature of the application, which corresponds to the second group of inventions, an isolation device between the transmission amplifier and the antenna input/output node is switched between a low and high impedance state for transmission and reception respectively by the transceiver (page 2, lines 5 to 12). Such isolation devices act as transmit switches (page 7, lines 13 and 14) and include a bias circuit for performing the switching function.

No explicit problem is said to be solved by this additional feature but the board understands that the problem of isolating a transmission amplifier from an antenna when the transceiver is in the receive state and decoupling of transmission amplifiers for different transmission bands when the transceiver is in the transmit state is thereby solved.

- 2.3 According to the description corresponding to Fig. 10 (page 17, line 28 - page 18, line 7), the above embodiments comprising a field effect transistor as a receive switch and a bias circuit as a part of a transmit switch may be combined.

3. According to Rule 13.2 PCT, the requirement of unity of invention is fulfilled only when there is a technical relationship among different groups of inventions involving one or more of the same or corresponding special technical features. The expression "special technical features" shall mean those technical features that define a contribution which each of the claimed inventions, considered as a whole, makes over the prior art.

3.1 In the present instance, the features in common between the inventions claimed in independent claims 1 and 17, namely a transceiver circuit comprising: a transmission amplifier coupled with an antenna input/output node wherein the transmission amplifier is configured to amplify communications to be transmitted from the transceiver circuit; and a receiver including a receiver input coupled with the antenna input/output node, are the well known basic components of a transceiver.

The further features of independent claims 1 and 17 relate to a field effect transistor as a receive switch on the one hand, as discussed at 2.1 above, and to an isolation device with a bias circuit as a transmit switch on the other hand, as discussed at 2.2 above.

3.2 The board fails to see any corresponding special technical feature which would link the further features of independent claims 1 and 17 and thereby the two groups of inventions in a way that would render the inventions of groups 1 and 2 unitary in the sense of Rule 13.1 and 13.2 PCT.

Furthermore, these further features of independent claims 1 and 17 are related to different, unlinked problems as indicated under 2.1 and 2.2 above.

Finally, as is clear from 2.3 above, although these further features may be combined they do not necessitate each other. The particular embodiment of Fig. 10 makes it clear that their combination in a single transceiver is optional.

3.3 The applicant's arguments are all based on the particular interoperational advantages of the above mentioned further features of independent claims 1 and 17. Although such advantages may well exist, independent claims 1 and 17 do not contain any combination of these further features, such a combination being considered optional throughout the application.

The reference on page 16, lines 25 to 27 to an NMOS transistor as part of the receive switch in combination with an isolation device and bias circuit is understood as a combined embodiment in which the two groups of features are both present but do not depend on each other. It is noted that the particular choice of an NMOS transistor is optional, see page 11, line 34 - page 12, line 5.

Similarly, the proposed advantage of having various combinations of receive and transmit bands available in a single transceiver is optional, see page 10, lines 1 to 7.

Finally, also the advantage of having all components integrated on a single chip is an option, see page 5, lines 22 to 26.

Order

For these reasons it is decided that:

The protest is rejected.

The Registrar:

The Chairman:

D. Magliano

A. S. Clelland