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D E C I S I O N
of 8 July 2003

Case Number: T 0088/01 - 3.5.2

Application Number: 88113180.9

Publication Number: 0305791

IPC: G08C 17/00

Language of the proceedings: EN

Title of invention:
High speed digital telemetry system for implantable devices

Patentee:
Pacesetter, Inc.

Opponent:
BIOTRONIK Mess- und Therapiegeräte GmbH & Co Ingenieurbüro Berlin

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - (yes) ex post facto analysis"

Decisions cited:
-

Catchword:
-

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Case Number: T 0088/01 - 3.5.2

D E C I S I O N
of the Technical Board of Appeal 3.5.2
of 8 July 2003

Appellant: (Opponent)
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Respondent: (Proprietor of the patent)
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 7 December 2000 rejecting the opposition filed against European patent No. 0305791 pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: W. J. L. Wheeler
Members: M. Ruggiu
P. Mühlens

Summary of Facts and Submissions

I. The opponent filed an appeal against the decision of the opposition division rejecting the opposition against European patent Nr. 0 305 791.

II. The independent claims 1 and 21 of the patent in suit as granted read as follows:

1. "A telemetry system for use with an implantable device, comprising:

a DC power source (20);

an inductor (10) for generating an information-containing magnetic field;

a first capacitor (12) for connection in parallel across said inductor, said first capacitor when connected across said inductor tuning said inductor to a first frequency;

a first switch (14) for selectively connecting said first capacitor in parallel across said inductor when said first switch is closed and disconnecting said first capacitor from parallel connection across said inductor when said first switch is open, said first switch being closed when data is to be transmitted by said inductor;

a second capacitor (16) for connection in parallel across said inductor, said second capacitor when connected across said inductor with said first

capacitor also connected across said inductor tuning said inductor to a second frequency;

a second switch (18) for selectively connecting said second capacitor in parallel across said inductor when said second switch is closed and disconnecting said second capacitor from parallel connection across said inductor when said second switch is open, said second switch being open both when no data is to be transmitted by said inductor and when one of a digital "0" or a digital "1" is to be transmitted by said inductor, said second switch being closed when the other of a digital "0" or a digital "1" is to be transmitted by said inductor, said second switch being opened or closed only when the voltage across said inductor is approximately at a positive or negative peak value; and

means (22, 24, 26, 28) for periodically, briefly switching said power source into connection across each of said first and second capacitors to charge said first and second capacitors."

21. "A method of telemetering data from an implantable device to an external device, comprising:

generating an information-containing magnetic field with an inductor;

selectively tuning said information-containing magnetic field to a first frequency or to a second frequency, said information-containing magnetic field being tuned to said first frequency by connecting a first capacitor across said inductor when one of a digital "0" or a

digital "1" is to be transmitted by said information-containing magnetic field, said information-containing magnetic field being tuned to said second frequency by connecting both said first capacitor and a second capacitor across said inductor when the other of a digital "0" or a digital "1" is to be transmitted by said information-containing magnetic field;

periodically, briefly energizing each of said first and second capacitors to charge said first and second capacitors when the voltage across said inductor is approximately either a positive or negative peak; and

receiving said information-containing magnetic field and deriving the information contained therein therefrom."

Claims 2 to 20 are dependent upon claim 1.

III. The appellant cited the following prior art documents which had already been considered in the procedure before the opposition division:

O2: US-A-4 453 162;

O3: pages 149 to 155 of "Taschenbuch Elektrotechnik" published by E. Philippow, second edition, 1985, VEB Verlag Technik, Berlin (DE); and

O7: US-A-4 561 443.

The appellant also cited a further prior art document in the statement of grounds of appeal:

O8: US-4 596 022.

IV. In response to summons to oral proceedings, the appellant submitted further arguments (letter of 6 June 2003), and the respondent filed three sets of claims as the basis for three auxiliary requests (letter of 6 June 2003).

V. Oral proceedings were held before the board on 8 July 2003.

The appellant (opponent) requested that the decision under appeal be set aside and that the patent be revoked.

The respondent (patentee) requested that the appeal be dismissed (main request), or, failing that, that the patent be maintained in amended form on the basis of the first, second, or third auxiliary request filed with the letter dated 6 June 2003.

VI. The appellant essentially argued as follows:

The closest prior art was disclosed in document O2, which described a telemetry system transmitting digital information from an implantable device. The system of O2 comprised a DC power source, an inductor, a capacitor and a switch for selectively connecting the capacitor in parallel with the inductor. In the system of O2, the switch was opened or closed only when the voltage across the inductor was approximately at a peak

value and the DC power source was periodically briefly connected to the capacitor to charge it when the voltage across the inductor was at a peak. The telemetry system of O2 used an on-off keying (OOK) modulation scheme, which resulted in a high harmonic content of the transmitted signal due to abrupt transitions, inherent to OOK, at the start and end of a transmitted bit. The subject-matter defined by claim 1 of the patent in suit differed from the system of O2 only in that a further capacitor and a further switch were provided for connection in parallel across the inductor. This allowed the system to transmit digital information using a frequency shift keying (FSK) modulation scheme, which reduced the harmonic content of the transmitted signal. Furthermore, FSK was faster and less sensitive to noise than OOK. Document O7 hinted at the advantageous signal to noise ratio provided by FSK and showed that FSK had already been used in medical devices. Document O3, which was a textbook and therefore represented common general knowledge of the skilled person, disclosed that FSK provided higher transmission speeds and had a low sensibility to disturbances. O3 also taught that amplitude and phase jumps should be avoided at the bit transitions of an FSK modulated signal. Although O3 suggested that it might be preferable to switch an inductance to vary the frequency of an FSK signal, it also mentioned switching a capacitance for that purpose. Furthermore, the circuit shown in Figure 1.163 of O3 varied the frequency by switching a capacitor in parallel to an inductor. Document O8 also showed that it was obvious to vary the frequency of an FSK signal by switching a capacitance in parallel to an inductor. Thus, it would be obvious to implement FSK in the

system of O2 by adding a capacitor and a switch in parallel with the inductor. This was particularly obvious because O2 already mentioned the existence of an additional, parasitic capacitance across the inductor, which resulted in a base oscillation frequency of the tuned circuit. All that was needed was to determine the desired value of the base oscillation frequency and thus of an additional capacitance to be inserted into the tuned circuit, which could be achieved in an obvious manner by means of a switch in series with a capacitor. Furthermore, it was obvious to avoid amplitude and phase jumps at the bit transitions by switching the capacitors only when the voltage across the inductor was approximately at a peak value. The capacitor of the system of O2 was charged periodically by connecting it briefly to the DC power source when the voltage across the inductor was at a peak and it was obvious to charge the capacitors of a circuit implementing FSK in the same way. This was particularly simple to achieve if, as in the patent in suit, one of the frequencies of the FSK modulated signal was twice as high as the other frequency. Thus, the subject-matter of claims 1 and 21 of the patent in suit was obvious to a skilled person and did not involve an inventive step.

VII. The arguments of the respondent can be summarized as follows:

The respondent considered that document O8 should not be admitted into the proceedings as it was no more relevant than the prior art cited previously. However, the respondent offered comments on O8 in the event that the document would nevertheless be admitted. Document

O2 proposed modulating the transmitted signal using on-off keying (OOK) or a form of phase shift keying. There was no suggestion in O2 of frequency shift keying (FSK) and the system described therein had only one operating frequency, which meant that it was not clear how to apply an FSK modulation scheme to the system of O2. Thus, it could not be seen how the skilled person would convert the system of O2 to FSK. Document O3 concerned alternating current telegraphy (ACT), including a discussion of FM ACT, and document O8 concerned telephony and radio and cable broadcasts. Thus, O3 and O8 were concerned with long distance transmission and did not pertain to the same technical field as O2. Furthermore, document O2 was concerned with using as little energy as possible for the transmission, while energy saving was of no concern in O3 and O8. Therefore, the skilled person would not consider O3 or O8 when looking for a solution to a problem arising in the system of O2. Even a combination of O2 with O3 or O2 with O8 would not lead the skilled person to the invention claimed in the patent in suit. O3 taught against implementing FSK by switching capacitors on and off, but preferred tapping an inductance instead. Thus, the appellant’s position that, once the skilled person had recognized that FSK was a desirable improvement to the system of O2, he would simply carry the teaching of an additional switched capacitor from O3 was simplistic and driven by hindsight. If anything, the skilled person would replace the entire modulation circuitry of O2 with an alternative FSK arrangement, reducing the relevance of O2 to no more than teaching that telemetry is used for medical prostheses. The skilled person would not merely tinker with the circuitry of O2 in order to convert it to an FSK scheme and it was

unrealistic to suggest that he would take random aspects out of O2, such as opening or closing the switch to the capacitor only when the voltage across the inductor was approximately at a peak value, and apply them when incorporating features of O3 or O8. The same applied to periodically briefly energizing the capacitor to charge it. Furthermore, the skilled person would not use the effect provided by the stray capacitance of the inductor of O2, because this stray capacitance was not controlled and was regarded as a nuisance in O2.

Reasons for the Decision

1. The appeal is admissible.

2. Novelty of the invention claimed in the patent in suit is not in dispute.

3. The board agrees with the parties to take the telemetry system described in document O2 as starting point for the examination of inventive step. The system of O2 comprises a DC power source 30; an inductor 22; a capacitor 20 for connection in parallel across the inductor; the capacitor when connected across the inductor tuning the inductor to a predetermined frequency; a switch 18 for selectively connecting the capacitor in parallel across the inductor, the switch being opened or closed only when the voltage across the inductor is approximately at a negative peak value; and means for periodically, briefly switching said power source into connection across said capacitor to charge it when the voltage across the inductor is

approximately at a positive peak. This switching of the power source occurs once during a cycle of the transmitted signal, i.e. at fixed, regular time intervals which are substantially equal to the period of the signal transmitted by the inductor. The telemetry system of O2 furthermore includes circuitry controlling the switch 18 so as to transmit a signal which is digitally modulated in accordance with an on-off keying (OOK) scheme or a form of phase shift keying (PSK) from an implantable device to an external receiver.

4. The subject-matter of claim 1 of the patent in suit differs from the system disclosed in O2 in particular by the provision of a further capacitor which, when connected with the pre-existing capacitor in parallel across the inductor, tunes the inductor to a further frequency, and of a further switch for selectively connecting the further capacitor in parallel across the inductor. Furthermore, O2 does not disclose that one of the switches is closed to connect the corresponding capacitor in parallel to the inductor when data is to be transmitted by the inductor; that the other switch is open both when no data is to be transmitted and when one of a digital "0" or a digital "1" is to be transmitted by the inductor; and that the other switch is closed when the other of a digital "0" or a digital "1" is to be transmitted by the inductor.

5. The effect of the novel features of claim 1 is in particular that the system is able to transmit in accordance with an FSK modulation scheme, which is known to provide a high signal to noise ratio (see O3, page 153, last paragraph). Obtaining this effect

therefore constitutes an objective problem solved by the invention.

6. In the judgment of the board, the step of changing the modulation scheme from OOK or PSK to FSK, i.e. from a scheme relying essentially on the generation of a single frequency to a scheme relying on the generation of at least two frequencies, is so fundamental that the skilled person would not consider adapting the circuitry which generates the transmitted signal in the system of O2, but would rather turn to circuitry which was already suitable for generating an FSK signal. Such circuitry is described in documents O3, O7 and O8.

7. Document O3 indicates it is preferable to provide a frequency shift by commutating between a whole inductor and a tap thereof rather than by switching capacitors on and off. O3 also teaches that amplitude and phase jumps at the bit transitions should be avoided. Figure 1.163 of O3 shows a circuit implementing FSK, which comprises a first capacitor C_2, which is permanently connected in parallel with part of a winding of a transformer, and a second capacitor C_1, which is connected to another winding of the transformer and can be selectively switched in parallel with that winding and thus effectively in parallel with the first capacitor C_2 through the transformer.

8. Document O7 describes a system using FSK to transmit data between an external transceiver and an implantable transceiver. The frequencies are provided by oscillators with miniature quartz tuning fork resonators 151, 152, one at each transmitting frequency, which run continuously once power is applied to the

transceiver. The signal transmitted from the implantable transceiver to the external transceiver is generated by controlling a switch 60 placed across a transmitting coil 58 (see in particular column 7, lines 46 to 66; column 13, line 65 to column 14, line 3; column 16, lines 41 to 47; and column 17, lines 2 to 8 and 35 to 47, of O7).

9. Document O8 describes a system using FSK modulation and comprising an inductor 48, a capacitor 50 permanently connected in parallel with the inductor, and a further capacitor 52 in series with a switch 56, the further capacitor 52 being connected in parallel across the inductor 48 and the capacitor 50 when the switch 56 is closed.

10. None of O3, O7 and O8 discloses implementing FSK by means of a circuit having two switches for selectively connecting each of two capacitors in parallel with an inductor, so that both capacitors can be disconnected from parallel connection across the inductor. Therefore, in the judgment of the board, the argument that this feature might be obvious to the skilled person relies on hindsight. The same applies to the argument that the skilled person might be inspired by the undesired presence of a stray capacitance in the inductor of O2, to provide a further capacitor for connection in parallel across the inductor and a further switch for selectively connecting this further capacitor across the inductor.

11. The board therefore concludes that, having regard to the state of the art, the subject-matter of claim 1 of the patent in suit is not obvious to a person skilled

in the art. The subject-matter of claim 1 has therefore to be considered as involving an inventive step in the sense of Article 56 EPC.

12. Because claims 2 to 20 are dependent on claim 1, their subject-matter can also be considered as involving an inventive step.

13. The subject-matter of claim 21 of the patent in suit differs from the prior art disclosed in O2 in particular by tuning the information-containing magnetic field to a first frequency by connecting a first capacitor across the inductor when one of a digital "0" or a digital 1" is to be transmitted; tuning the information-containing magnetic field to a second frequency by connecting both the first and a second capacitor across the inductor when the other of a digital "0" and a digital "1" is to be transmitted; and periodically, briefly energizing each of said first and second capacitors to charge them when the voltage across the inductor is approximately either at a positive or negative peak.

14. As already stated in paragraph 6 above, in the judgment of the board the skilled person would not consider modifying the circuitry of O2 to provide FSK operation. But even if he did consider selectively connecting one or two capacitors across an inductor to generate the frequencies required by FSK, he would not find any suggestion in O3, O7 or O8 to briefly energize the capacitors when the voltage across the inductor is approximately at a peak. Without hindsight, it would therefore not be obvious to the skilled person to realise that it is nevertheless possible in such a case

to charge the two capacitors by periodically, briefly energizing them when the voltage across the inductor is approximately at a positive or negative peak.

The board therefore concludes that, having regard to the state of the art, the subject-matter of claim 21 of the patent in suit is not obvious to a person skilled in the art and has to be considered as involving an inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Sauter W. J. L. Wheeler