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Datasheet for the decision
of 13 January 2011

Case Number: T 1348/07 - 3.4.01

Application Number: 00309261.6

Publication Number: 1094332

IPC: G01R 3/565

Language of the proceedings: EN

Title of invention:
Phase distribution measurement method and apparatus, phase
correction method and apparatus, and magnetic resonance
imaging apparatus

Applicant:
GE Medical Systems Global Technology Company LLC

Opponent:
-

Headword:
-

Relevant legal provisions:
-

Relevant legal provisions (EPC 1973):
EPC Art. 84

Keyword:
"Clarity (no)"

Decisions cited:
-

Catchword:
-

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Case Number: T 1348/07 - 3.4.01

D E C I S I O N
of the Technical Board of Appeal 3.4.01
of 13 January 2011

Appellant: GE Medical Systems Global Technology Company LLC
3000 North Grandview Boulevard
Waukesha
Wisconsin 53188   (US)

Representative: Pedder, James Cuthbert
London Patent Operation
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15 John Adam Street
London WC2N 6LU   (GB)

Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted 16 March 2007
refusing European patent application
No. 00309261.6 pursuant to Article 97(1) EPC
1973.**

Composition of the Board:

Chairman: B. Schachenmann
Members: F. Neumann
H. Wolfrum

C5116.D

Summary of Facts and Submissions

I.   The appeal lies from the decision of the examining
        division to refuse the European patent application
        number 00 309 261.6.

II.   The appellant has requested that the decision be set
        aside and a patent be granted on the basis of claims 1
        to 15 filed with the statement of the grounds of appeal
        dated 23 July 2007.

        As an auxiliary measure, oral proceedings were
        requested.

III.   The Board issued a summons to oral proceedings and in
        an annex thereto set out the points to be discussed. It
        was anticipated that inventive step would be the main
        issue, but that clarity and sufficiency of disclosure
        may have to be discussed in order to fully understand
        the invention. The annex to the summons concluded by
        drawing attention to some clarity objections.

IV.   The appellant responded to the summons simply by
        cancelling the request for oral proceedings and
        requesting a decision according to the state of the
        file. No comments or amendments were filed in reaction
        to the observations set out in the annex to the summons.

Reasons for the Decision

1.   The invention concerns the "unwrapping" of a phase map
        which has been obtained by calculating the phase of

magnetic resonance imaging (MRI) data for each pixel of
an image.

Mapping the phase information of an MRI signal pixel-
by-pixel provides a representation in which all phase
values within the resulting phase map lie within the
range -π to +π. This is because the value of the phase
of the complex MRI signal is represented by a
"principal value" contained in the range -π to +π. Phase
values lying outside this range are "wrapped around" to
give a principal value within the range. This wrapping
procedure consists of adding or subtracting a multiple
of 2π such that the result is contained within the
principal range. The phase values represented on the
phase map are therefore ambiguous: they may contain any
multiple of 2π but will still be represented by the same
principal value.

In order to access the true phase information contained
in a wrapped phase map, it must first be "unwrapped".
This unwrapping process can be considered to be a
correction process in which the true phase value is
determined from the wrapped phase value.

In order to unwrap the phase map, the application
proposes calculating phase differentials for each pixel
of a magnetic resonance image, calculating the
corresponding integrals for each pixel and forming a
new ("corrected") phase map from these integrals. In
this way, an unwrapped phase map is obtained, the phase
values of which are no longer limited to the range -π to
+π.

2.   In the annex to the summons to oral proceedings dated
        27 October 2010, the Board raised, *inter alia*, the
        following objections which are still maintained.

2.1   Independent claim 1 is directed to a phase distribution
        measurement method comprising the steps of calculating
        differentials of phases of pixel data in a magnetic
        resonance image for each pixel and calculating
        integrals of said differentials for each pixel. The
        step of "forming a phase distribution from said
        integrals", which was included in a previous version of
        claim 1, has been omitted from present claim 1 in
        response to the criticism of the examining division
        that this step adds nothing to claim 1 since the step
        of integration itself provides a phase distribution.

        The aim of the invention is to provide an unwrapped
        phase map (see paragraphs [0008], [0009], [0010] and
        [0122] of the published application) yet the method
        defined in claim 1 ends with the step of calculating
        (or of low-pass filtering) the integrals of the
        differentials.

        The examining division held that the integration
        already gives a phase distribution and that it is not
        clear which additional processing the step of "forming
        a phase distribution from said integrals" actually
        comprises. However, according to the description (see
        paragraph [0121] of the published application),
        integration is performed by an integral calculating
        unit 704 and then this step is followed up by the
        formation of a phase map in phase map forming unit 706
        using the output data of the integral calculating unit.
        Hence the raw data resulting from the pixel-by-pixel

calculation of the integrals is subjected to a further processing step to obtain the desired phase map. The Board agrees with the examining division that a phase distribution can be derived from the individual pixel-by-pixel integration values but the description consistently presents that a further processing step is performed to convert this raw data to a phase distribution. The fact that a method step which is consistently presented as being essential to the performance of the invention is in fact missing from the independent method claim, means that claim 1 is not supported by the description (Article 84 EPC 1973).

2.2 Correspondingly, independent claim 6 is directed to a phase distribution measuring apparatus comprising means for calculating differentials of phases of pixel data in a magnetic resonance image for each pixel and means for calculating integrals of said differentials for each pixel. The "phase distribution forming means", which was previously included in claim 6, has now been omitted therefrom, resulting in a lack of support by the description (Article 84 EPC 1973).

2.3 A further consequence of these omissions is that the reference to "said phase distribution" in claims 4, 5, 9 and 10 lacks an antecedent, making these claims unclear (Article 84 EPC 1973).

3. The presence of this deficiency is enough, on its own, to justify refusal of the application. In spite of being fully aware of this deficiency - attention having been drawn thereto in the annex to the summons to oral proceedings dated 27 October 2010 - the appellant has not made any attempt to overcome this objection, but

instead has explicitly requested a decision according
to the state of the file.

In these circumstances, the Board considers that it is
not unreasonable to refuse the application on this
basis alone and that it is not necessary to enter into
a discussion of any other issues.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

R. Schumacher   B. Schachenmann

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