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**Datasheet for the decision
of 16 August 2011**

Case Number: T 0376/09 - 3.4.01

Application Number: 05256515.7

Publication Number: 1666911

IPC: G01R 33/561

Language of the proceedings: EN

Title of invention:

Phase cycling method in SSFP pulse sequence and magnetic resonance imaging apparatus

Applicant:

GE Medical Systems Global Technology Company, LLC

Opponent:

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Headword:

-

Relevant legal provisions:

-

Relevant legal provisions (EPC 1973):

EPC Art. 84

Keyword:

"Lack of clarity"

Decisions cited:

-

Catchword:

-



Case Number: T 0376/09 - 3.4.01

D E C I S I O N
of the Technical Board of Appeal 3.4.01
of 16 August 2011

Appellant: GE Medical Systems Global Technology Company, LLC
3000 North Grandview Boulevard
Waukesha
Wisconsin 53188-1696 (US)

Representative: Pedder, James Cuthbert
London Patent Operation
General Electric International, Inc.
15 John Adam Street
London WC2N 6LU (GB)

Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 1 September 2008
refusing European patent application
No. 05256515.7 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman: B. Schachenmann
Members: H. Wolfrum
P. Fontenay

Summary of Facts and Submissions

I. European patent application 05 256 515.7 (publication No. 1 666 911) was refused by a decision of the examining division dispatched on 1 September 2008, on grounds set out in a communication of 16 July 2008 concerning lack of clarity (Article 84 EPC 1973) of the claims and added subject-matter (Article 123(2) EPC) in the sole request then on file.

II. The applicant lodged an appeal against the decision and paid the prescribed fee on 3 November 2008. On 6 January 2009 a statement of grounds of appeal was filed. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of a set of claims 1 to 10 filed with the statement of grounds of appeal. Moreover, an auxiliary request for oral proceedings was made.

III. On 15 April 2011 the appellant was summoned to oral proceedings to take place on 24 August 2011.

In a communication annexed to the summons the board pointed *inter alia* to problems of clarity of the claims of the request on file.

IV. By a letter dated 24 May 2011 the appellant cancelled its request for oral proceedings and requested a decision according to the state of the file.

By notification of 25 July 2011 the oral proceedings were cancelled.

V. Independent claims 1 and 4 of the appellant's request read as follows :

"1. A phase cycling method, for use in SSFP pulse sequence for a gradient echo system in which phase shift of lateral magnetization developed in the TR by the gradient magnetic field is rolled back before the next RF excitation, said method comprising the steps of:

identifying as unusable RF transmission phase an RF transmission phase developing a band artifact around a zero phase shift, based on a relationship between the RF transmission phase and an amount of phase shift developing the band artifact; and

performing a phase cycling without using said unusable RF transmission phase and by using a plurality of RF transmission phases other than said unusable RF transmission phase, wherein said plurality of RF transmission phases has values that an increment of each transmission phase splits unequally in a two dimensional plane around 180 degrees of the two dimensional plane."

"4. A magnetic resonance imaging apparatus that uses phase cycling method for obtaining echo data in a plurality of views by setting the spin within the subject into SSFP status, comprising a data processing unit configured to:

identifying as unusable RF transmission phase an RF transmission phase developing a band artifact around a zero phase shift, based on a relationship between the RF transmission phase and an amount of phase shift developing the band artifact; and

performing a phase cycling without using said unusable RF transmission phase and by using a plurality of RF transmission phases other than said unusable RF transmission phase, wherein said plurality of RF transmission phases has values that an increment of each transmission phase splits unequally in a two dimensional plane around 180 degrees of the two dimensional plane."

Claims 2, 3 and 5 to 10 are dependent claims.

Reasons for the Decision

1. In the light of the entry into force of the EPC 2000, reference is made to Article 7(1), 2nd sentence of the Revision Act of 29 November 2000 ("Act revising the Convention on the Grant of European Patents (European Patent Convention) of 5 October 1973, last revised on 17 December 1991") and the transitional provisions for the amended and new provisions of the EPC (Decision of the Administrative Council of 28 June 2001), from which it may be derived which Articles of the EPC 1973 are still applicable and which Articles of the EPC 2000 shall apply.
2. The appeal complies with the requirements of Articles 106 to 108 and Rule 99 EPC and is, therefore, admissible.
3. In its aforementioned communication the board had expressed its preliminary view that it concurred with a number of clarity objections raised by the examining

division, notwithstanding the appellant's arguments given in the statement of the grounds of appeal.

Since the appellant neither replied to these objections nor filed any amendments to the claim definitions, the board has no reason to change its preliminary opinion.

- 3.1 It is not clear what exactly is to be done in order to carry out the step of "*identifying as unusable RF transmission phase an RF transmission phase developing a band artifact around a zero phase shift, based on a relationship between the RF transmission phase and an amount of phase shift developing the band artifact*", comprised in claims 1 and 4 on file.

First of all, it would appear from the application documents as a whole (see in particular Figures 1, 2 and 4 with the corresponding description) that the claimed step is a conceptual activity, ie the act of realising that a specific phase cycling sequence of RF transmission pulses (presumably the sequence $0^\circ - 0^\circ - 0^\circ - 0^\circ$) is at the origin of a certain band artifact, rather than an activity which would actually be executed by a magnetic resonance imaging apparatus.

Moreover, the concrete meaning of various terms used is ambiguous.

Specifically, the question arises as to what the "*unusable RF transmission phase*" actually is, when, in the light of the description of Figures 2 and 4, it is not a single phase value but a specific sequence of phases of the RF excitation pulses which lead to a certain band artifact (see also dependent claim 5 of the current request). If the term is intended to

exclude an RF phase of 0° from a phase cycle, this would then contradict the additional feature of dependent claims 2 and 6, according to which "*at least one RF transmission phase among a plurality of RF transmission phases (other than said unusable RF transmission phase) uses the repetition of 0-180-0-180 degrees where the increment of transmission phase is 180 degrees*".

In addition, it remains obscure what exactly is defined by the "*band artifact around the zero phase shift*" since it is not clear precisely which phase shift is being referred to. Does the term "phase shift" refer to the previously mentioned phase shift of the lateral magnetization which would be "*rolled back*" before the next excitation, to a phase shift B "*developed in the lateral magnetization within TR, caused by for example ununiformity [sic!] of static field*" (see paragraph [0030] of the published description), to some "*phase shift in the FISP*" (see paragraph [0032]), or to the phase shift in the center of the image (in which case it would refer to the phase encoding gradient; see paragraph [0033]) ?

Finally, it is not clear what the "*relationship between the RF transmission phase and the amount of phase shift developing the band artifact*" would be. The phases of the RF transmission pulses definitely influence the lateral magnetization of the excited spin system and thus the strength of the measured resonance signal, as is apparent from the specific examples of equations 2(a)-(d) and 3(a)-(d), discussed in paragraphs [0029] to [0034] for the particular RF phase cycle sequences $0^\circ-180^\circ-0^\circ-180^\circ$ and $0^\circ-0^\circ-0^\circ-0^\circ$, respectively.

However, in addition to the fact that the meaning of the term "*phase shift developing the band artifact*" is unclear, it is not at all apparent which relationship connecting a phase shift of the observed signal to the RF transmission phase (a parameter which does not even figure in the cited equations) could possibly be deduced from all this.

- 3.2 The second step defined in claims 1 and 4 on file, which refers to performing a phase cycling, is also unclear.

Again reference is made to the ambiguous term "*unusable RF transmission phase*".

Moreover, the definition "*wherein said plurality of RF transmission phases has values that an increment of each transmission phase splits unequally in a two-dimensional plane around 180 degrees of the two dimensional plane*" is incomprehensible. In the context of phase cycle SSFP methods, an "increment of a transmission phase" is understood as the amount of the shift in the phase of two consecutive RF transmissions in a sequence of excitations. It is not understandable how such an increment could possibly be "*split*" into two pieces in a two-dimensional plane in general and around a value of 180° in particular. In the description, the claimed definition is reproduced twice almost word-for-word (cf paragraphs [0013] and [0020] of the published application), but no explanation is given.

- 3.3 In the statement of grounds of appeal, which include a reference to arguments comprised in a letter of the

applicant of 17 June 2008, the appellant stressed the point that the inventor of the present application felt the content of the claims to be quite clear to a man skilled in the art. Moreover, the appellant considered the identical wording of the granted parallel US Patent 7,327,139 B2 as evidence that the wording provided was viewed as fully understandable by an examiner in an English language prosecution and thus presumably understandable by a man skilled in the art.

This argumentation is unsuccessful because it does not address the specific clarity objections set out above, as already indicated in the board's communication to the appellant (see point 3. above).

4. For the above reasons, the appellant's request on file does not comply with the requirement of Article 84 EPC 1973.

In conclusion, the appellant's request is not allowable.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar

The Chairman

R. Schumacher

B. Schachenmann