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D E C I S I O N
of 8 December 2005

Case Number: T 0182/05 - 3.4.01

Application Number: 99937991.0

Publication Number: 1060403

IPC: G01R 33/44

Language of the proceedings: EN

Title of invention:
Apparatus for and method of nuclear quadrupole resonance testing a sample in the presence of interference

Applicant:
BTG INTERNATIONAL LIMITED (Company No. 2664412)

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 52(1), 56, 84

Keyword:
"Clarity, novelty, inventive step - yes (after amendment)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0182/05 - 3.4.01

D E C I S I O N
of the Technical Board of Appeal 3.4.01
of 8 December 2005

Appellant: BTG INTERNATIONAL LIMITED
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Representative: Johnson, Reginald George
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Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 13 September 2004 refusing European application No. 99937991.0 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: B. Schachenmann
Members: R. Bekkering
H. Wolfrum

Summary of Facts and Submissions

I. European patent application 99 937 991.0 (publication nos. WO-A-99 45408 and EP-A-1 060 403) was refused pursuant to Article 97(1) EPC by a decision of the examining division dispatched on 13 September 2004.

II. The applicant (appellant) lodged an appeal against the decision on 17 November 2004 and paid the appeal fee on the same day. The statement of the grounds of appeal was received on 24 January 2005.

III. Reference was made *inter alia* to the following documents:

D0: M.D. Rowe et al, "Mine detection by nuclear quadrupole resonance", EUREL international conference, 1996, pages 62 to 66

D1: T. Hirschfeld et al, "Short range remote NQR measurements", Journal of Molecular Structure, vol. 58, 1980, pages 63 to 77

D3: US-A-4 665 368

D5: WO-A-97 03366

IV. Oral proceedings, requested as an auxiliary measure by the appellant, were held on 8 December 2005.

V. The appellant requested that the decision under appeal be set aside and a patent be granted on the basis of the following documents:

Claims: No. 1 to 10 filed in the oral proceedings on 8 December 2005;

Description: Pages 1 to 3, 3a, 4 to 17 filed in the oral proceedings on 8 December 2005;

Drawings: Sheets 1/8 to 8/8 filed in the oral proceedings on 8 December 2005.

VI. Claim 1 reads as follows:

"*1. A method of Nuclear Quadrupole Resonance (NQR) testing a sample for the presence of a concealed object comprising a substance containing a given species of quadrupolar nucleus, in the presence of material which gives rise to spurious interference in response to NQR excitation, the method comprising:*
providing a first antenna having a first field of view and a second antenna having a second field of view such that the expected size of the object is small compared to the field of view of each antenna;
arranging the first antenna (80) and the second antenna (82) at a distance larger than the expected size of the object and small enough so that the material which gives rise to spurious interference is in the field of view of both the first antenna (80) and the second antenna (82) and generates substantially the same response signal in the two antennas,
applying NQR excitation to the sample using said first antenna (80) and applying NQR excitation using said second antenna (82);
detecting response signals, using the first and second antennas (80, 82) to the excitation applied to yield a

first signal to yield a first and second response signal, respectively; and
combining the first response signal and the second response signal using common mode rejection so as to attenuate the spurious interference relative to the NQR response from the object, if present".

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rule 64 EPC and is, therefore, admissible.

2. *Amendments*

Claim 1 is based on originally filed claim 21, with the additional features which relate to the excitation being provided by means of both the first and the second antenna being derivable from the original description as published on page 9, lines 18 to 24, the additional features relating to the arrangement of the first and second antenna and the respective fields of view having regard to the expected size of the object searched for being derivable from the original description on page 8, lines 16 to 25, and the utilization of common mode rejection being derivable from the original description on page 7, lines 10 to 13.

Dependent claims 2 and 3 are based on originally filed claims 2 to 5 and the original description, page 12, line 25.

Dependent claim 4 is based on originally filed claims 17 and 18, as well as the original description (see page 14, lines 31, 32).
Dependent claim 5 is based on the original description (see page 9, lines 10 to 16) and on originally filed figures 1 and 11.
Dependent claim 6 is based on the original description (see page 12, line 11).
Dependent claim 7 is based on originally filed claim 14.
Dependent claim 8 is based on originally filed claims 15 and 16.
Dependent claims 9 and 10 are based on originally filed claims 7 and 23, respectively.

The Board is thus satisfied that the amendments to these claims comply with the requirements of Article 123(2) EPC.

3. *Clarity and sufficiency of disclosure*

Claim 1 as amended is considered to now provide a sufficiently clear definition of the method in particular in view of the definition in the claim of the field of view of the antennas having regard to the expected size of the object and of the material giving rise to the spurious interference, as well as of the use of common mode rejection for combining the detected signals (Article 84 EPC). As far as the sufficiency of the disclosure of the invention is concerned so that it can be carried out by a skilled person (Article 83 EPC), the board is satisfied that the method, except for in a few particular cases (such as where the object searched for happens to lie exactly between the two antennas),

will result in concealed objects being actually detected.

4. *Novelty, inventive step*

4.1 Document D0 is concerned with the detection of landmines. The document addresses, like the application in suit, the problem of interference in NQR caused by the piezo-electric signal generated by quartz present in the sand or the soil by the electric field of the RF NQR excitation pulse (see page 65, left-hand column, first paragraph and right-hand column, last paragraph). Accordingly, D0 may be taken as the closest prior art. One of the solutions suggested in document D0 is the use of a slotted and earthed aluminium foil screen in front of the antenna. While the application in suit also envisages such a screen as an additional measure (see dependent claim 2), the subject-matter of claim 1 in suit differs from document D0 in substance by the use of a second antenna for both excitation and detection and by the combination, using common mode rejection, of the signals from both antennas for the attenuation of the piezo-electric interference signal relative to the NQR signal.

4.2 Novelty of the subject-matter of claim 1 is, thus, provided over document D0. Novelty is also provided with respect to the remaining available more remote prior art.

4.3 The use of two antennas for both excitation and detection as per claim 1 typically results in one of the antennas only detecting the spurious interference, allowing, by using common mode rejection, for an

effective elimination of the interference from the signal detected by the other antenna and a consequential increase in the detectability of any NQR signals from a concealed object.

Having regard to the disclosure of document D0, the objective problem-to-be-solved in the present case may, thus, be seen as further improving the attenuation of spurious interference emanating from the sample in response to the NQR excitation relative to the NQR signal indicative of the presence of a concealed object, a problem which per se must be considered obvious to the skilled person working in the technical field of NQR detection.

4.4 As far as the solution offered according to claim 1 in suit is concerned, reference may be made to document D1, relating to the same field of remote NQR detection of landmines, drugs and explosives in packages and the like. In this document the provision of a second coil ("bucking coil") is suggested for the reduction of interference such as caused by electrical noise and broadcasting signals (see page 65, point 2; page 66, point 9). However, there is no suggestion in document D1 to use such a "bucking" coil to detect spurious interference signals, emanating from the sample and caused by the NQR excitation itself, or to use the second "bucking" coil to provide NQR excitation to the sample. Accordingly, the solution as provided in claim 1 is not considered to be rendered obvious by document D1.

4.5 Document D3 (see column 1, lines 51 to 63; column 3, lines 8 to 45; figure 3) discloses an NMR imaging

apparatus including noise detecting coils for detecting mainly foreign noise in addition to the detecting coils for the NMR signal. By producing a difference from the outputs of the coils, noise can be removed from the NMR signal. However, besides the fact that document D3 belongs to the slightly different technical field of NMR rather than NQR, the noise addressed in D3 is external noise rather than interference from the sample as a result of the excitation signals. Furthermore, the noise detecting coils are not conceived for providing excitation signals to the sample. Hence, the subject-matter of claim 1 is not considered to be obvious having regard to document D3.

4.6 Reference may also be made to document D5 (see page 18, line 26 to page 19, line 6 and figure 2), disclosing the use of one or more antennas for the detection of for instance explosives in sand. The document, however, fails to provide information as to how, in case of more than one antenna, these antennas and their respective fields of view would be arranged, and how the response signals received by the antennas would be combined for the purposes of detection. Accordingly, the subject-matter of claim 1 is also not considered to be rendered obvious by document D5.

4.7 For the reasons above, the subject-matter of claim 1 is considered to be novel and to involve an inventive step (Articles 52(1), 54 and 56 EPC).

4.8 The dependent claims 2 to 10 contain further features of the method and, thus, involve an inventive step as well.

5. The description and drawings have been adapted to the amended claims as appropriate.

6. It is left to the discretion of the first instance to request fair copies of the documents for grant in view of the extensive handwritten amendments made to the claims, description and drawings.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the examining division with the order to grant a patent on the basis of the following documents filed at the oral proceedings:

Claims: No. 1 to 10;

Description: Pages 1 to 3, 3a, 4 to 17;

Drawings: Sheets 1/8 to 8/8.

The Registrar: The Chairman:

R. Schumacher B. Schachenmann