

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**
(PCT Rule 43*bis*.1)

To:

see form PCT/ISA/220

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/B2019/059646

International filing date (day/month/year)
10.11.2019

Priority date (day/month/year)
29.11.2018

International Patent Classification (IPC) or both national classification and IPC
INV. G01R33/383 ADD. H01F7/02

Applicant
EPSITAU LTD.

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:



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Date of completion of this opinion

see form PCT/ISA/210

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Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - the international application in the language in which it was filed.
 - a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. forming part of the international application as filed:
 - in the form of an Annex C/ST.25 text file.
 - on paper or in the form of an image file.
 - b. furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. furnished subsequent to the international filing date for the purposes of international search only:
 - in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|---|
| Novelty (N) | Yes: Claims | <u>3, 5, 8, 14, 16, 19</u> |
| | No: Claims | <u>1, 2, 4, 6, 7, 9-13, 15, 17, 18, 20-22</u> |
| Inventive step (IS) | Yes: Claims | <u>5, 16</u> |
| | No: Claims | <u>1-4, 6-15, 17-22</u> |
| Industrial applicability (IA) | Yes: Claims | <u>1-22</u> |
| | No: Claims | |

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Re Item V.

1 The following documents are referred to in this written opinion.

D1 US 2012/013338 A1 (SAKELLARIOU DIMITRIOS [FR] ET AL) 19 January 2012
(2012-01-19)

D2 US 5 801 609 A (LASKARIS EVANGELOS TRIFON [US] ET AL) 1 September 1998
(1998-09-01)

2 Lack of novelty and/or of an inventive step (Art. 33 PCT)

2.1 Independent claims 1, 12

The subject-matter of **claim 1** lacks novelty with respect to document D1 for the following reasons.

Document D1 discloses (references in square brackets apply thereto):

A magnet array

[The magnet assembly shown in Fig. 2 can be identified with the "magnet array" defined in the claim.],

comprising:

multiple magnet rings, which are positioned along a longitudinal axis and coaxially with the longitudinal axis

[Each of the magnet rings of the assembly shown in Fig. 2 can be identified with one of the "multiple magnet rings" defined in the claim. In this regard, it can be inferred from Fig. 2 that these rings were "positioned along a longitudinal axis and coaxially with the longitudinal axis" as defined in the claim, namely with

respect to the z-axis shown in the figure.

Further in this regard, compare with the description, paragraph 61.],

wherein at least one of the magnet rings possesses rotational symmetry and has both a finite component of magnetization along an azimuthal coordinate, and a finite magnetization in a longitudinal-radial plane

[It can be inferred from Fig. 2 that each of the rings possessed "rotational symmetry" as defined in the claim, namely with respect to the z-axis.

Furthermore, e.g. the bottom ring shown in Fig. 2 can be identified with the "at least one of the magnet rings" defined in the claim.

According to paragraph 72 of the description, this bottom comprised an alternating arrangement of elements 110 which had a divergent radial magnetization as shown in Fig. 8A and of elements 150A which had a Halbach magnetization as shown in Fig. 12A.

Therefore, the bottom ring had "both a finite component of magnetization along an azimuthal coordinate" as defined in the claim (namely the azimuthal magnetization component provided by the elements 150A shown in Fig. 12A), "and a finite magnetization in a longitudinal-radial plane" as defined in the claim (namely the divergent radial magnetization provided by the elements 110 shown in Fig. 8A)],

the multiple magnet rings configured to jointly generate a magnetic field along a direction parallel to the longitudinal axis

[According to paragraph 59 of the description, the magnet assembly was configured to generate a homogeneous magnetic field that was pointing at the magic angle with respect to the longitudinal axis of the magnet assembly. This implies that the magnetic field had a non-vanishing component in parallel with the longitudinal axis, i.e. "the multiple magnet rings" were "configured to jointly generate a magnetic field along a direction parallel to the longitudinal axis" as defined in the claim.];

a frame, which is configured to fixedly hold the multiple magnet rings in place

[From the overall context of D1, there can be no doubt that the individual magnet elements of the assembly shown in Fig. 2 were mechanically fixed to to one another because, otherwise, the assembly would not have been mechanically stable. The means used for this mechanical fixation can be identified with the "frame ... configured to fixedly hold the multiple magnet rings in place" defined in the claim.].

At least implicitly, D1 discloses a method for producing the magnet assembly as well. Therefore, the lack of novelty holds for the subject-matter of **claim 12** as well.

2.2 **Dependent claims 2-4, 6-11, 13-15, 17-22**

The additional features of these dependent claims are either known from, or rendered obvious by the available prior art (see the passages of D1-DX cited in the search report).

More specifically with respect to **claims 2 and 13**, compare with paragraph 59 of D1 according to which a homogeneous magnetic field was generated at the center of the magnetic structure.

With respect to **claims 3 and 14**, it would appear that the skilled person, starting from D1 and desiring to avoid detrimental effects caused by the magnetic field of the assembly in areas located outside of the assembly, would minimize a fringe field of the assembly in the well-known manner without exercising inventive skill.

With respect to **claims 4 and 15**, compare with the rotational symmetry of the assembly shown in Fig. 2 of D1.

With respect to **claims 6 and 17**, compare with paragraph 72 of D1 according to which the bottom ring of the assembly shown in Fig. 2 comprised elements 110

with divergent radial magnetization whereas the top ring of the assembly comprised elements 120 of convergent radial magnetization. As a consequence, the assembly shown in Fig. 2 had a reflectional asymmetry as defined in the claim.

With respect to **claims 7 and 18**, compare with the inner volume of the assembly shown in Fig. 2 of D1.

With respect to **claims 8 and 19**, it would appear that the skilled person, starting from the assembly shown in Fig. 2 of D1 would construct the assembly in the same way as the assembly shown in Fig. 1 of D1 solely in accordance with circumstances, without exercising inventive skill.

With respect to **claims 9, 10, 20 and 21**, compare with the bottom ring of the assembly shown in Fig. 2 of D1.

With respect to **claims 11 and 22**, compare with the rings of the assembly shown in Fig. 2 of D1 which were provided in addition to the bottom ring.

- 3 It would appear that the subject-matter of **claims 5 and 16** meets the requirements of Art. 33 PCT with respect to the available prior art for the following reasons.

The distinguishing feature defined by **claim 5** according to which the minimal inner radius of the magnet rings positioned on one side of a center of the inner volume is different from the minimal inner radius of the magnet rings positioned on the other side provides the technical effect of adapting the shape of the inner volume of the magnet assembly to measurement objects having a first part with relatively smaller dimensions and a second part with relatively larger dimensions (such as the head and shoulders of a human subject). Therefore, the distinguishing feature identified above solves the problem of providing a magnet assembly having an optimised geometry for MRI of the head and shoulders (compare with the description, page 5, lines 19-25).

Starting from D1 and being faced with this problem, the skilled person would consider document D2 because the same problem is mentioned therein (D2,

col. 5, lines 22-37). However, the solution known from D2 does not fall within the scope of claim 5 because the magnet assembly according to D2 comprises a plurality of superconducting coils (126, 132, 144, 146, 148, 150 and 184 in Fig. 1 of D2) which are magnetized in the same or in mutually opposite directions (D2, col. 4, lines 51-67) and not in the specific manner defined in claim 1 (upon which claim 5 is dependent).

Therefore, by starting from D1 and by adopting the solution to the problem posed known from D2, the skilled person would not arrive at the subject-matter of claim 5.

The same is true for **claim 16** which defines a corresponding method claim.

Re Item VII.

4 Certain defects

- 4.1 According to Rule 5.1a (ii) PCT, document D1 should have been identified in the description and briefly discussed.
- 4.2 The independent claims should have been drafted in the two-part form in accordance with Rule 6.3(b) PCT, with those features known from the closest prior art (probably document D1) being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).
- 4.3 According to Rule 6.2(b) PCT, reference signs should have been added to the claims.