

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 653350WO01	FOR FURTHER ACTION		See item 4 below
International application No. PCT/JP2018/006994	International filing date (<i>day/month/year</i>) 26 February 2018 (26.02.2018)	Priority date (<i>day/month/year</i>) 07 March 2017 (07.03.2017)	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant MITSUBISHI ELECTRIC CORPORATION			

<p>1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).</p> <p>2. This REPORT consists of a total of 11 sheets, including this cover sheet.</p> <p>In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.</p>																								
<p>3. This report contains indications relating to the following items:</p> <table> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table> <p>4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).</p>	<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input type="checkbox"/>	Box No. II	Priority	<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input checked="" type="checkbox"/>	Box No. VI	Certain documents cited	<input type="checkbox"/>	Box No. VII	Certain defects in the international application	<input type="checkbox"/>	Box No. VIII	Certain observations on the international application
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<p align="center">The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No. +41 22 338 82 70</p>	<p>Date of issuance of this report 10 September 2019 (10.09.2019)</p>
	<p>Authorized officer</p> <p align="center">Mineko Mohri</p> <p>e-mail: pct.team8@wipo.int</p>

PATENT COOPERATION TREATY

TRANSLATION

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:

Date of mailing (day/month/year)	15.05.2018
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Applicant's or agent's file reference 653350W001	FOR FURTHER ACTION See paragraph 2 below
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International application No. PCT/JP2018/006994	International filing date (day/month/year) 26.02.2018	Priority date (day/month/year) 07.03.2017
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International Patent Classification (IPC) or both national classification and IPC
H01P1/387 (2006.01) i, H01P11/00 (2006.01) i

Applicant
MITSUBISHI ELECTRIC CORPORATION

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 43bis.1(a)(i) with regard to novelty, inventive step or 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 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 66.1bis(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/JP	Date of completion of this opinion	Authorized officer
Facsimile No.		Telephone No.

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Box No. I Basis of this 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:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No. PCT/JP2018/006994
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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
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1. Statement			
Novelty (N)	Claims	1-8	YES
	Claims	_____	NO
Inventive step (IS)	Claims	2-5	YES
	Claims	1, 6-8	NO
Industrial applicability (IA)	Claims	1-8	YES
	Claims	_____	NO

2. Citations and explanations:	
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Document 1: JP 2015-80056 A (MITSUBISHI ELECTRIC CORPORATION) 23 April 2015, paragraphs [0014]-[0048], fig. 1-12 (Family: none)

Document 2: JP 9-121104 A (TOKIN CORP.) 06 May 1997, paragraphs [0014]-[0018], fig. 1-4 (Family: none)

Document 3: WO 2016/151847 A1 (MITSUBISHI ELECTRIC CORPORATION) 29 September 2016 (Family: none)

Claims 1 and 6

Document 1 (particularly fig. 12 and the description thereof) discloses:

"a non-reciprocal circuit element, comprising:
a magnetic plate (2) having one main surface,
another main surface on the side opposite to the one main surface, and a plurality of input/output terminals (22);
a dielectric component (3) connected on the one main surface of the magnetic plate (2);

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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

a permanent magnet (4) connected to the side of the dielectric component (3) opposite to the magnetic plate (2); and

a circuit substrate (5) connected to the other main surface side of the magnetic plate (2) and having a plurality of signal conductors (51),

wherein the surface of the dielectric component (3) on the permanent magnet side has formed therein a cavity (3D) having a bottom surface that extends in a direction along the one main surface and a side surface that extends in a thickness direction intersecting the bottom surface, and

wherein at least a portion of the permanent magnet (4) is disposed inside the cavity (3D), and

the surface of said at least a portion of the permanent magnet (4) disposed inside the cavity (3D) is fixed to the bottom surface via an adhesive (8) ”.

(The quotation above is from the claims (claim 1) of the present application. The reference characters in the parentheses are the reference characters in the drawings in document 1.)

Thus, when the invention as in claim 1 is compared with the invention disclosed in document 1, the inventions differ in the following two points, and are the same in other points. Namely,

Difference 1

The presence/absence of a “magnetic yoke connected to the side of the permanent magnet opposite to the magnetic plate”.

Difference 2

Whether or not "the surface of said at least a portion of the permanent magnet disposed inside the cavity is fixed to both the bottom surface and the side surface via an adhesive".

These two differences are examined below.

First, in regard to difference 1, in the technical field of non-reciprocal circuit elements, providing a "magnetic yoke (10) connected to the side of the permanent magnet (6) opposite to the magnetic plate (1)" is disclosed in the invention disclosed in document 2.

It is considered that a person skilled in the art could have easily attempted to apply the configuration disclosed in document 2 to the non-reciprocal circuit element of the invention disclosed in document 1 in order to form a magnetic circuit.

Next, in regard to difference 2, configuring the adhesive location in the invention disclosed in document 1 for fixing the permanent magnet to the bottom surface of the cavity via an adhesive to be not only a bottom surface, but "both the bottom surface and the side surface", could merely be addressed, as appropriate, by a person skilled in the art in consideration of improving the adhesive strength, etc.

In addition, in regard to claim 6, "the circuit substrate (5) has a pad electrode (54), the magnetic

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

plate (2) has a ground electrode (23), and the pad electrode (54), the plurality of input/output terminals (22), and the ground electrode (23) are electrically connected (9, 31, 32)" (claim 6) is disclosed in the invention disclosed in document 1.

Accordingly, claims 1 and 6 do not involve an inventive step in the light of documents 1 and 2.

Claims 7 and 8

Document 1 (particularly paragraphs [0029]-[0040], [0048]) discloses:

"a manufacturing method for a non-reciprocal circuit element, the method comprising:

a step (S11) for forming a magnetic plate (2) having one main surface, another main surface on the side opposite to the one main surface, and a plurality of input/output terminals (22);

a step (S21) for connecting a dielectric component (3) on the one main surface of the magnetic plate (2);

a step (S23) for connecting a permanent magnet (4) to the side of the dielectric component (3) opposite to the magnetic plate (2); and

a step (S22) for connecting a circuit substrate (5) having a plurality of signal conductors (51) to the other main surface side of the magnetic plate (2),

wherein the surface of the dielectric component (3) on the side where the permanent magnetic (4) is connected has formed therein a cavity (3D) having a bottom surface that extends in a direction along the one main surface and a side surface that extends in a thickness direction

intersecting the bottom surface, and

wherein, in the step for connecting the permanent magnet (4), while at least a portion of the permanent magnet (4) is disposed inside the cavity (3D), the surface of said at least a portion of the permanent magnet (4) disposed inside the cavity (3D) is fixed to the bottom surface via an adhesive (8)".

(The quotation above is from the claims (claim 7) of the present application. The reference characters in the parentheses are the reference characters in the drawings in document 1.)

Thus, when the invention as in claim 7 is compared with the invention disclosed in document 1, the inventions differ in the following two points, and are the same in other points.

Difference 1

The presence/absence of a "step for connecting a magnetic yoke to the side of the permanent magnet opposite to the magnetic plate."

Difference 2

Whether or not "in the step for connecting the permanent magnet, while at least a portion of the permanent magnet is disposed inside the cavity, the surface of said at least a portion of the permanent magnet disposed inside the cavity is fixed to both the bottom surface and the side surface via an adhesive".

These two differences are examined below.

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

First, in regard to difference 1, in the technical field of non-reciprocal circuit elements, providing a "magnetic yoke (10) connected to the side of the permanent magnet (6) opposite to the magnetic plate (1)" is disclosed in the invention disclosed in document 2.

It is considered that a person skilled in the art could have easily attempted to provide a step for connecting the magnetic yoke disclosed in the invention disclosed in document 2 to the manufacturing method for the non-reciprocal circuit element of the invention disclosed in document 1 in order to form a magnetic circuit.

Next, in regard to difference 2, configuring the adhesive location in the invention disclosed in document 1 for fixing the permanent magnet to the bottom surface of the cavity via an adhesive to be not only a bottom surface, but "both the bottom surface and the side surface", could merely be addressed, as appropriate, by a person skilled in the art in consideration of improving the adhesive strength, etc.

Furthermore, in regard to claim 8, "the step for connecting the magnetic yoke is performed while a state is maintained in which the surface of said at least a portion of the permanent magnet is fixed to both the bottom surface and the side surface via the adhesive" (claim 8) is merely a design matter that could be selected, as appropriate, by a person skilled in the art while taking into consideration workability during

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assembly, etc.

Accordingly, the invention as in claims 7 and 8 does not involve an inventive step in the light of documents 1 and 2.

Claims 2-5

The invention as in claims 2-5 is not disclosed in any of the documents cited in the ISR and is not considered to have been possible to easily invent by a person skilled in the art from the documents. In particular, the documents do not disclose "the side surface of the cavity includes a defect part in a section surrounding the permanent magnet in a plan view" (claim 2), "the dielectric component has a greater dimension in a direction along the one main surface on the magnetic plate side than a dimension in a direction along the one main surface on the magnet side" (claim 3), or "the magnetic plate includes a plurality of through holes that connect the one main surface and the other main surface" (claim 4).

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Box No. VI Certain documents cited

1. Certain published documents (Rule 43bis.1 and 70.10)

Application No. Patent No.	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
WO 2017/188131 A1	02.11.2017	21.04.2017	27.04.2016

[E, A]

2. Non-written disclosures (Rule 43bis.1 and 70.9)

Kind of non-written disclosure	Date of non-written disclosure (day/month/year)	Date of written disclosure referring to non-written disclosure (day/month/year)
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