

**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)	<b>15.05.2018</b>
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Applicant's or agent's file reference <b>653350W001</b>	<b>FOR FURTHER ACTION</b> See paragraph 2 below
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International application No. <b>PCT/JP2018/006994</b>	International filing date (day/month/year) <b>26.02.2018</b>	Priority date (day/month/year) <b>07.03.2017</b>
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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:

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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		
1. Statement			
	Novelty (N)	Claims <u>1-8</u>	YES
		Claims _____	NO
	Inventive step (IS)	Claims <u>2-5</u>	YES
		Claims <u>1, 6-8</u>	NO
	Industrial applicability (IA)	Claims <u>1-8</u>	YES
		Claims _____	NO
2. Citations and explanations:			
<p>Document 1: JP 2015-80056 A (MITSUBISHI ELECTRIC CORPORATION) 23 April 2015, paragraphs [0014]-[0048], fig. 1-12 (Family: none)</p> <p>Document 2: JP 9-121104 A (TOKIN CORP.) 06 May 1997, paragraphs [0014]-[0018], fig. 1-4 (Family: none)</p> <p>Document 3: WO 2016/151847 A1 (MITSUBISHI ELECTRIC CORPORATION) 29 September 2016 (Family: none)</p> <p>Claims 1 and 6</p> <p>Document 1 (particularly fig. 12 and the description thereof) discloses:</p> <p>"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);</p>			

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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

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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.

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)

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

**[E, A]**

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

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