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**Octrooi Centrum  
Nederland**

11

**2017885**

**12 B1 OCTROOI**

21

Aanvraagnummer: **2017885**

51

Int. Cl.:  
**G01D 11/24 (2017.01)**

22

Aanvraag ingediend: **29/11/2016**

41

Aanvraag ingeschreven:  
**11/06/2018**

73

Octrooihouder(s):  
**Sencio B.V. te Nijmegen.**

43

Aanvraag gepubliceerd:  
-

72

Uitvinder(s):  
**Ignatius Josephus van Dommelen  
te Vorstenbosch.**

47

Octrooi verleend:  
**11/06/2018**

45

Octrooischrift uitgegeven:  
**18/06/2018**

74

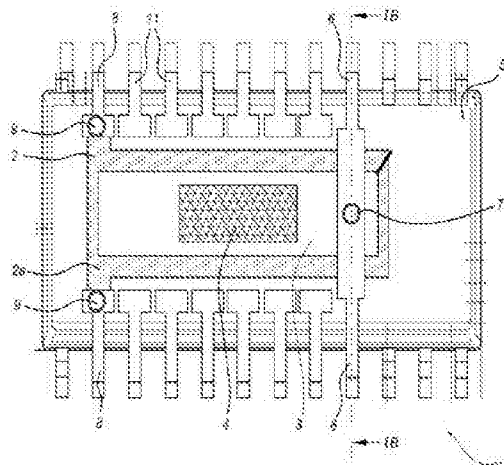
Gemachtigde:  
**ir. M.F.J.M. Ketelaars c.s. te Den Haag.**

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**Sensor package and method of manufacturing the same**

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A sensor package (1) with a package body (5) enclosing at least in part a substrate (2) and a plurality of lead frame members (6, 8). The substrate (2) has a first sensor element (3) on a first side surface (2a). The package body (5) comprises an aperture (5a) exposing a sensitive surface (4) of the first sensor element (3). Electrically conductive glue connections (7, 9) are provided between contact terminals of the first sensor element (3) and one or more of the plurality of lead frame members (6, 8).



## Sensor package and method of manufacturing the same

### Field of the invention

The present invention relates to a sensor package, in particular to a sensor package  
5 comprising a package body enclosing at least in part a substrate and a plurality of lead frame  
members. In a further aspect, the present invention relates to a method of manufacturing such a  
sensor package, wherein the method comprises providing a lead frame of electrically conductive  
material, the lead frame comprising a plurality of lead frame members.

### 10 Background

US patent US20150177171A1 discloses a gas sensor package comprising a gas sensor  
adhered to one side of a readout integrated circuit (IC) device wherein the IC device is electrically  
connected with a lead frame with bonding wires. The gas sensor comprises a sensing surface on  
an exposed side, and a heater element on the other side. A micro electro mechanical system  
15 (MEMS) based cap including a supporting part and plate are in contact with a mould which is used  
to cover the readout IC and the lead frame to form the gas sensor package.

### Summary

The present invention seeks to provide a sensor package for a sensor requiring (partial)  
20 exposure to the environment, such as a gas sensor. Furthermore, the present invention seeks to  
provide a structure of the sensor package which allows easy, cost effective and reliable  
manufacturing.

According to the present invention, a sensor package of the type defined in the preamble  
is provided, wherein the substrate comprises a first sensor element on a first surface, wherein the  
25 package body comprises an aperture exposing a sensitive surface of the first sensor element, and  
wherein the sensor package further comprises an electrically conductive glue connection between  
contact terminals of the first sensor element and one or more of the plurality of lead frame members.  
Such a glue (or adhesive) based electrically conducting connection between the sensor element  
and (one or more) lead frame members provides a very reliable electrical connection for a large  
30 variety of different types of sensor elements, which is fully compatible with the moulding technique  
of the sensor package.

An encapsulation technology which is known as such is used for an exposed die type of  
moulding of the sensor package in order to make sure that the sensitive surface of the sensor  
element is sufficiently exposed. The sensor package body comprises an aperture exposing at least  
35 part of the first sensor element allowing a well-defined area of the sensor fully exposed to the  
environment properly allowing measurement of the associated sensing parameter. This is  
specifically relevant for industrial applications such as environmental sensing, gas sensing, flow  
sensing and for bio-sensing. Due to the fact that sensors are getting smaller in size, the present  
invention enables cost-effective manufacturing of advanced functional packages in high volume  
40 production, while achieving higher device reliability.

In a further aspect, the present invention relates to a method for manufacturing such a sensor package, as defined in the preamble above. The method further comprises applying electrically conductive glue (or adhesive) to one or more of the plurality of lead frame members, positioning contact terminal parts of the first sensor element on the first side surface of the substrate against the electrically conductive glue on the one or more of the plurality of lead frame members, and moulding the package body at least in part around the substrate and the plurality of lead frame members and providing an aperture in the package body exposing at least in part a sensitive surface which is part of the first sensor element.

By applying such a method wherein the sensor package is provided with simplified internal electrical connections using a conductive glue or adhesive (which can be easily applied in liquid form), a reliable and cost-effective manufacturing method is provided. The sensor package according to the present invention embodiments further facilitates the manufacturing process such that overall complexity and cost of manufacturing is reduced. The present invention enables to protect the sensors and the supporting electronics to operate in a harsh environment such as an environment including corrosive gases and/or fluids, or an environment with a varying temperature.

### **Short description of drawings**

The present invention will be discussed in more detail below, with reference to the attached drawings.

Figure 1A shows a two dimensional top view of a sensor package 1 with a first sensor element on top according to an embodiment of the present invention.

Figure 1B shows a cross sectional view of the sensor package shown in Fig. 1A along the line IB-IB.

Figure 2 shows a three dimensional view of a sensor package according to a further embodiment of the present invention.

Figure 3 shows a three dimensional view of a sensor package according to an even further embodiment of the present invention with additional components in the sensor package.

Figure 4 shows a bottom view of a sensor package according to an even further embodiment of the present invention with a heater element.

### **Description of embodiments**

In many applications, sensors are being used for measuring a myriad of parameters which require exposure of a sensitive surface to an environment. It would be advantageous if a sensor can be made available in a sensor package which is similar to the well-known integrated circuit packaging technologies. This would allow cost-effective manufacturing and better integration in further electronics devices.

Figure 1A shows a top view of a sensor package 1 according to a first embodiment of the present invention. In this embodiment, the sensor package 1 comprises a package body 5 enclosing at least in part a substrate 2 and a plurality of lead frame members 6, 8, 11 (as a regular moulded

package of e.g. an integrated circuit). In the embodiment shown, only the lead frame members indicated with reference numerals 6 and 8 are actually used as external contacts, while the further lead frame members 11 are not connected. The substrate 2 in this embodiment is arranged to be a first sensor element 3.

5           Electrical contact is provided between contact terminals of the sensor element 3 using an electrically conductive glue (or adhesive) connection 7, 9. In the embodiment shown, one of the sensor element terminals is connected to a bridging set of lead frame members 6 using an electrically conductive glue connection 7, and the other one of the sensor element terminals is connected to two lead frame members 8 using an electrically conductive glue connection 9. In  
10       general, any substrate 2 being arranged to act as a first sensor element 3 can be accommodated in the package body 5, and one, two or even more of the sensor element terminals can be connected to one, two or even more of the plurality of lead frame member 6, 8 for providing external connections. Suitable electrically conductive glue or adhesive compounds are readily available which can be applied easily on the lead frame members 6, 8. After bringing the lead frame member  
15       6, 8 in contact with contact terminal parts of the first sensor element 3 with the electrically conductive glue connection 7, 9 in between, a strong and durable (electrical) connection is obtained (e.g. by evaporation of a solvent, or by applying a hardening radiation).

          Thus, in a generic sense, the present invention embodiments relate to a sensor package comprising a package body 5 enclosing at least in part a substrate 2 and a plurality of lead frame  
20       members 6, 8, wherein the substrate 2 comprises a first sensor element 3 on a first surface 2a and wherein the package body 5 comprises an aperture 5a exposing a sensitive surface 4 of the first sensor element 3, and wherein the sensor package 1 further comprises an electrically conductive glue connection 7, 9 between contact terminals of the first sensor element 3 and one or more of the plurality of lead frame members 6, 8.

25           Figure 1B shows a cross sectional view of the sensor package 1 shown in Fig. 1A along the line IB-IB. A cross sectional view is shown of the (bridged) lead frame member 6 within the packaged body 5. It comprises the lead frame 6 as the top structure which is connected to the first sensor element 3 by an electrically conductive glue 7. As shown in this cross sectional view, the substrate 2 comprises a first side surface 2a and a second side surface 2b. The lead frame  
30       comprising the plurality of lead frame members 6, 8 is designed to allow the glue based electrical connections 7, 9 by simply positioning the substrate 2 on its first side surface 2a onto predetermined quantities of glue 7, 9 on the proper aligned positions on the lead frames 6, 8, respectively. This cross sectional view clearly shows that the electrically conductive glue connection 7, 9 is provided on the first side surface 2a of the substrate 2.

35           In an exemplary embodiment the first sensor element 3 encapsulated within the sensor package 1 is a gas sensor, e.g. a hydrogen sensor. To implement a hydrogen sensor the substrate 2 is e.g. provided as a substrate with a titanium oxide layer 4, which is sensitized for detecting hydrogen (H<sub>2</sub>) by adding platinum Pt (or alternatively palladium Pd). Other types of hydrogen sensors of a substrate type are also conceivable, e.g. based on a semiconductor oxide film such  
40       as tin oxide (SnO<sub>2</sub>), silicon oxide (SiO<sub>2</sub>) or titanium oxides (TiO or TiO<sub>2</sub>), onto which one or more

areas/layers of a noble metal acting as a catalyst, such as platinum or palladium, are applied (e.g. using a sputtering technique). In further alternatives, layers of catalyst material (e.g. palladium Pd) on a flexible or rigid substrate may be applied. More generically, the gas sensor in a further embodiment is a hydrogen gas sensor comprising a titanium oxide layer, wherein the electrically  
5 conductive glue connection 7, 9 is provided between terminal parts of the first sensor element 3 (i.e. one on the substrate 2 and one on the sensitive surface 4 part) and the one or more of the plurality of lead frame members 6, 8. The aperture 5a in the package body 5 allows to have a direct contact between the sensing area of the sensitive surface 4 and the gas to be sensed in the environment.

10 Figure 2 shows a three dimensional view of a sensor package 1 according to a further embodiment of the present invention. As shown, the package body 5 encloses at least in part the substrate 2 and the plurality of (connected) lead frame members 6, 8. The substrate 2 comprises a first side surface 2a provided with a first sensor element 3 (having a sensitive surface 4) and the package body 5 has an aperture 5a exposing at least in part the sensitive surface 4 of the first  
15 sensor element 3. The aperture 5a ensures a proper exposure of the sensitive surface 4 of the first sensor element 3 to the environment, while the IC like package body 5 and lead frame members 6, 8 allow for easy inclusion of the sensor package 1 in an electronic device.

Figure 3 shows a three dimensional view of a sensor package according to an even further embodiment of the present invention with additional components in the sensor package. The sensor  
20 package is provided with an integrated circuit 10 and/or a second sensor element 12 which are electrically connected to further ones of the plurality of lead frame members 11 via bonding wires 13. These bonding wires 13 are included in (and protected by) the package body 5 as in any normal integrated circuit package. The integrated circuit 10 and/or sensor element 12 are mechanically attached to the second surface side 2b of the substrate 2. In a generalization of this embodiment,  
25 the substrate 2 further comprises a second side surface 2b provided with one or more electronic components 10, 12, 14. As shown in the embodiment of Fig. 3, the one or more electronic components 10, 12, 14 are electrically connected by means of bonding wires 13 to further ones of the plurality of lead frame members 11.

In exemplary embodiments, the one or more electronic components 10, 12, 14 comprise,  
30 an integrated circuit 10, and/or a second sensor element 12, e.g. a temperature sensor. As shown in the embodiment of Fig. 3, the terminals of the second sensor element 12 are connected to further lead frame members 11 via bonding wires 13. Additionally or alternatively, bonding wires 13 may also be provided directly between second sensor element 12 and integrated circuit 10. The characteristic response of a gas sensor (or as an example a hydrogen sensor) as implemented in  
35 the first sensor element 3 is affected by variation in temperature, and this effect must be considered in a real life application of gas sensors. To overcome this limitation, the first sensing element 3 is accompanied by a second sensing element 12 in the form of a temperature sensor on the same substrate 2 (on its second side surface 2b). In this way it is possible to correct the measurement signal from the gas sensor (first sensing element 3) to obtain a reliably measured gas concentration  
40 under varying temperatures. As mentioned above, for electrical connection, the second sensor

element 12 in this embodiment is wire bonded (using bonding wire 13) to further ones of the plurality of lead frame members 11.

Figure 4 shows a (two dimensional) bottom view of a sensor package 1 according to an even further embodiment of the present invention with a heater element 14. The heater element 14 is provided directly onto the second side surface 2b of the substrate 2, e.g. as a thin film resistor element. The heater element 14 is electrically connected to two further ones of the plurality of lead frame members 11, again using bonding wires 13.

In a further aspect, the present invention also relates to a method of manufacturing a sensor package according to any one of the embodiments described above. The inventive method embodiments comprise providing a lead frame of electrically conductive material, the lead frame comprising a plurality of lead frame members 6, 8; applying electrically conductive glue to one or more of the plurality of lead frame members 6, 8; positioning contact terminal parts of the first sensor element 3 on the first side surface 2a of the substrate 2 against the electrically conductive glue on the one or more of the plurality of frame members 6, 8; and moulding the package body 5 at least in part around the substrate 2 and the plurality of lead frame members 6, 8 and providing an aperture 5a in the package body 5 exposing at least in part a sensitive surface part 4 of the first sensor element 3. As in a normal process for manufacturing an integrated circuit package, also in this process for manufacturing a sensor package, the method may further comprise trimming a portion of the lead frame that extends outside the package body 5 to provide the sensor package 1 with a plurality of external electrical contacts. For the embodiments wherein further electronic components 10, 12, 14 are provided on the second side surface 2b of the substrate, the method in a further embodiment further comprises providing one or more electronic components 10, 12, 14 on a second side surface 2b of the substrate 2; and wire bonding the one or more electronic components 10, 12, 14 to further ones of the plurality of lead frame members 11.

The above described exemplary embodiments may be summarized in the following interdependent and numbered embodiment descriptions:

Embodiment 1. Sensor package comprising a package body (5) enclosing at least in part a substrate (2) and a plurality of lead frame members (6, 8), wherein the substrate (2) comprises a first sensor element (3) on a first side surface (2a) and wherein the package body (5) comprises an aperture (5a) exposing a sensitive surface (4) of the first sensor element (3), and wherein the sensor package (1) further comprises an electrically conductive glue connection (7, 9) between contact terminals of the first sensor element (3) and one or more of the plurality of lead frame members (6, 8).

Embodiment 2. Sensor package according to embodiment 1, wherein the electrically conductive glue connection (7, 9) is provided on the first side surface (2a) of the substrate (2).

Embodiment 3. Sensor package according to embodiment 1 or 2, wherein the first sensor element (3) is a gas sensor.

Embodiment 4. Sensor package according to embodiment 3, wherein the gas sensor is a hydrogen gas sensor comprising a titanium oxide layer, wherein the electrically conductive glue connection

(7, 9) is provided between terminal parts of the first sensor element (3) and the one or more of the plurality of lead frame members (6, 8).

Embodiment 5. Sensor package according to any one of embodiments 1-4, wherein the substrate (2) further comprises a second side surface (2b) provided with one or more electronic components (10, 12, 14).

Embodiment 6. Sensor package according to embodiment 5, wherein the one or more electronic components (10, 12, 14) are electrically connected by means of bonding wires (13) to further ones of the plurality of lead frame members (11).

Embodiment 7. Sensor package according to embodiment 5 or 6, wherein the one or more electronic components (10, 12, 14) comprises a second sensor element (12), e.g. a temperature sensor.

Embodiment 8. Sensor package according to any one of embodiments 5-7, wherein the one or more electronic components (10, 12, 14) comprises an integrated circuit (10).

Embodiment 9. Sensor package according to any one of embodiments 5-8, wherein the one or more electronic components (10, 12, 14) comprises a thin film heater element (14) on the second side surface (2b).

Embodiment 10. Method of manufacturing a sensor package according to any one of embodiments 1-9, comprising:

providing a lead frame of electrically conductive material, the lead frame comprising a plurality of lead frame members (6, 8);

applying electrically conductive glue to one or more of the plurality of lead frame members (6, 8);

positioning contact terminal parts of the first sensor element (3) on the first side surface (2a) of the substrate (2) against the electrically conductive glue on the one or more of the plurality of lead frame members (6, 8); and

moulding the package body (5) at least in part around the substrate (2) and the plurality of lead frame members (6, 8) and providing an aperture (5a) in the package body (5) exposing at least in part a sensitive surface (4) of the first sensor element (3).

Embodiment 11. Method according to embodiment 10, further comprising trimming a portion of the lead frame that extends outside the package body (5) to provide the sensor package (1) with a plurality of external electrical contacts.

Embodiment 12. Method according to embodiment 10 or 11, further comprising

providing one or more electronic components (10, 12, 14) on a second side surface (2b) of the substrate (2);

wire bonding the one or more electronic components (10, 12, 14) to further ones of the plurality of lead frame members (11).

The present invention has been described above with reference to a number of exemplary embodiments as shown in the drawings. Modifications and alternative implementations of some parts or elements are possible, and are included in the scope of protection as defined in the appended claims.

## CONCLUSIES

1. Sensorbehuizing omvattende een behuizingslichaam (5) dat ten minste gedeeltelijk een substraat (2) en een veelvoud aansluitraamelementen (6, 8) omvat, waarbij het substraat (2) een eerste sensorelement (3) omvat op een oppervlak aan een eerste zijde (2a) en waarbij het  
5 eerste sensorelement (3) omvat op een oppervlak aan een eerste zijde (2a) en waarbij het behuizingslichaam (5) een opening (5a) omvat die een gevoelig oppervlak (4) van het eerste sensorelement (3) blootstelt, en waarbij de sensorbehuizing (1) verder een elektrisch geleidende lijmverbinding (7, 9) omvat tussen contactaansluitingen van het eerste sensorelement (3) en één of meer van het veelvoud aansluitraamelementen (6, 8).  
10
2. Sensorbehuizing volgens conclusie 1, waarbij de elektrisch geleidende lijmverbinding (7, 9) voorzien is op het oppervlak aan een eerste zijde (2a) van het substraat (2).
3. Sensorbehuizing volgens conclusie 1 of 2, waarbij het eerste sensorelement (3) een  
15 gassensor is.
4. Sensorbehuizing volgens conclusie 3, waarbij de gassensor een waterstofgassensor is die een titaniumoxidelaag omvat, waarbij de elektrisch geleidende lijmverbinding (7, 9) voorzien is tussen aansluitdelen van het eerste sensorelement (3) en de één of meer van het veelvoud  
20 aansluitraamelementen (6, 8).
5. Sensorbehuizing volgens één van de conclusies 1-4, waarbij het substraat (2) verder een oppervlak aan een tweede zijde (2b) omvat dat voorzien is van één of meer elektronische componenten (10, 12, 14).  
25
6. Sensorbehuizing volgens conclusie 5, waarbij de één of meer elektronische componenten (10, 12, 14) elektrisch verbonden zijn door middel van aansluitdraden (13) met andere van het veelvoud aansluitraamelementen (11).
- 30 7. Sensorbehuizing volgens conclusie 5 of 6, waarbij de één of meer elektronische componenten (10, 12, 14) een tweede sensorelement (12) omvatten, bijvoorbeeld een temperatuursensor.
8. Sensorbehuizing volgens één van de conclusies 5-7, waarbij de één of meer elektronische  
35 componenten (10, 12, 14) een geïntegreerde schakeling (10) omvatten.
9. Sensorbehuizing volgens één van de conclusies 5-8, waarbij de één of meer elektronische componenten (10, 12, 14) een dunne-film-verwarmingselement (14) op het oppervlak aan een tweede zijde (2b) omvatten.  
40



10. Werkwijze voor het vervaardigen van een sensorbehuizing volgens één van de conclusies 1-9, omvattende:

verschaffen van een aansluitraam van elektrisch geleidend materiaal, waarbij het aansluitraam een veelvoud aansluitraamelementen (6, 8) omvat;

5           aanbrengen van elektrisch geleidende lijm op één of meer van het veelvoud aansluitraamelementen (6, 8);

            positioneren van contactaansluitdelen van het eerste sensorelement (3) op het oppervlak aan een eerste zijde (2a) van het substraat (2) tegen de elektrisch geleidende lijm op de één of meer van het veelvoud aansluitraamelementen (6, 8); en

10           vormen van het behuizinglichaam (5) ten minste gedeeltelijk rond het substraat (2) en het veelvoud aansluitraamelementen (6, 8), en verschaffen van een opening (5a) in het behuizinglichaam (5) om daarmee ten minst een deel van een gevoelig oppervlak (4) van het eerste sensorelement (3) bloot te stellen.

15   11.    Werkwijze volgens conclusie 10, verder omvattende het bijsnijden van een deel van het aansluitraam dat zich uitstrekt buiten het behuizinglichaam (5) om de sensorbehuizing (1) te verschaffen met een veelvoud externe elektrische contacten.

12.    Werkwijze volgens conclusie 10 of 11, verder omvattende

20           verschaffen van één of meer elektronische componenten (10, 12, 14) op een oppervlak aan een tweede zijde (2b) van het substraat (2);

            draadverbinden van de één of meer elektronische componenten (10, 12, 14) aan verdere van het veelvoud aansluitraamelementen (11).

25

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Fig. 1A

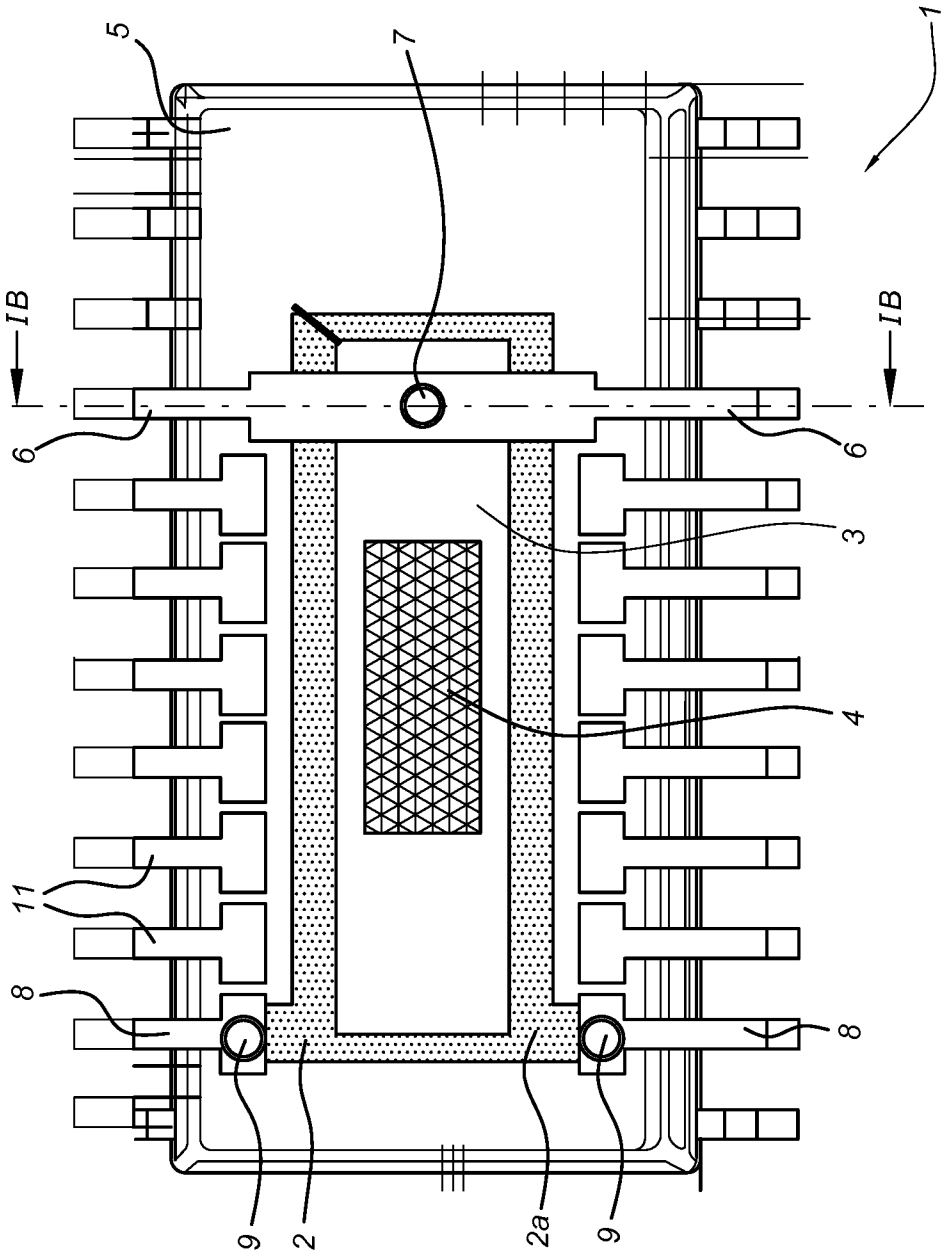


Fig. 1B

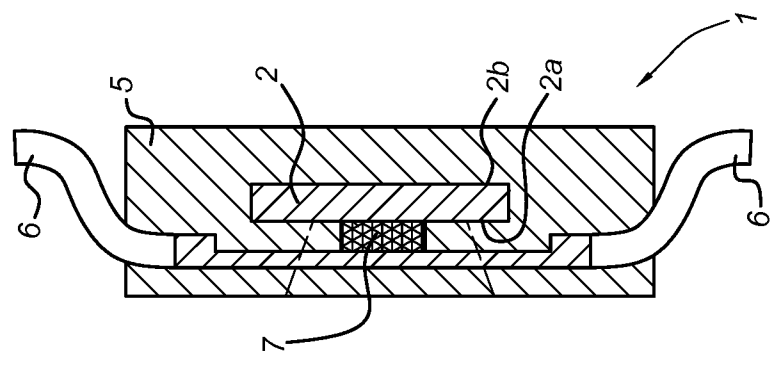


Fig. 2

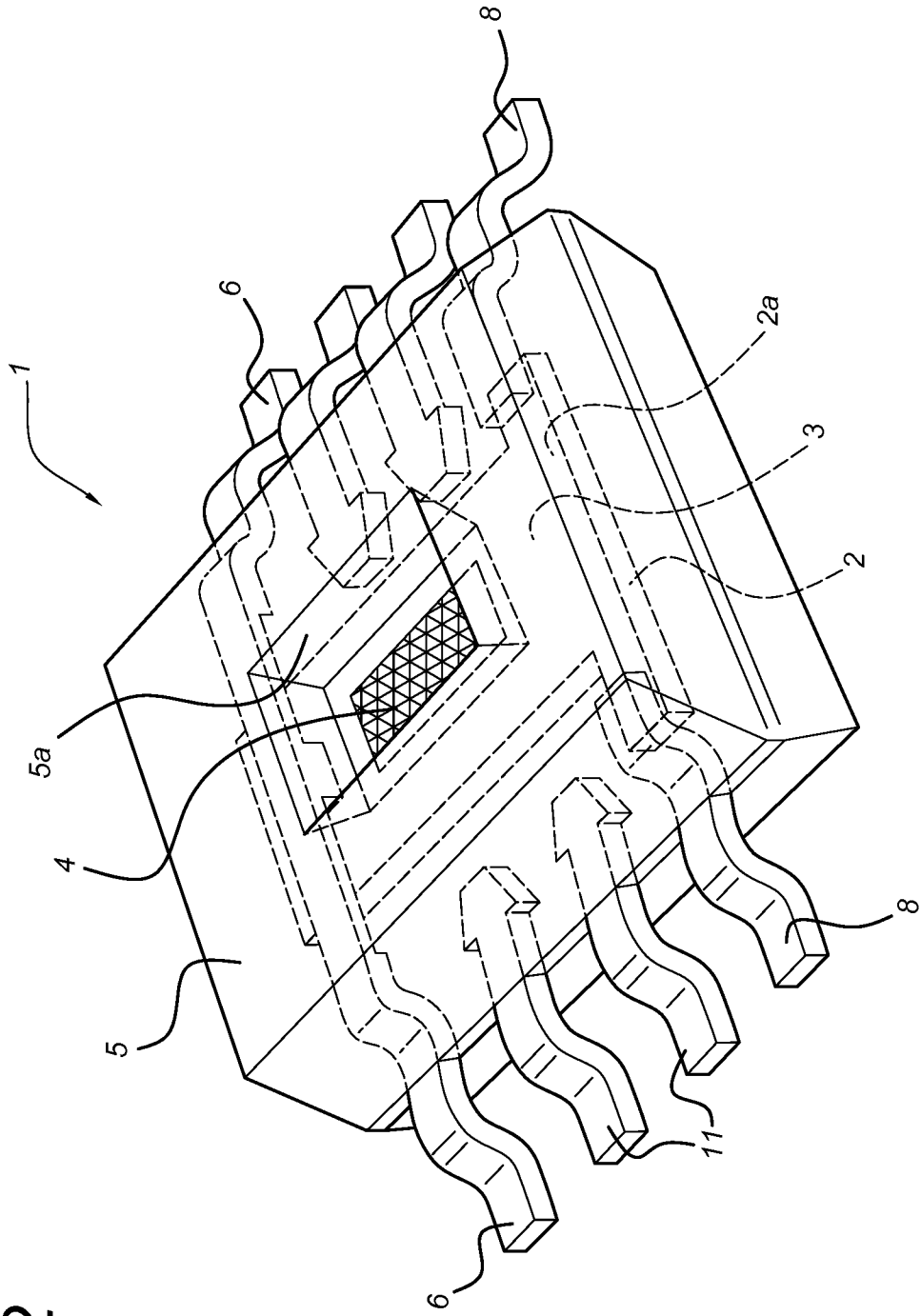


Fig. 3

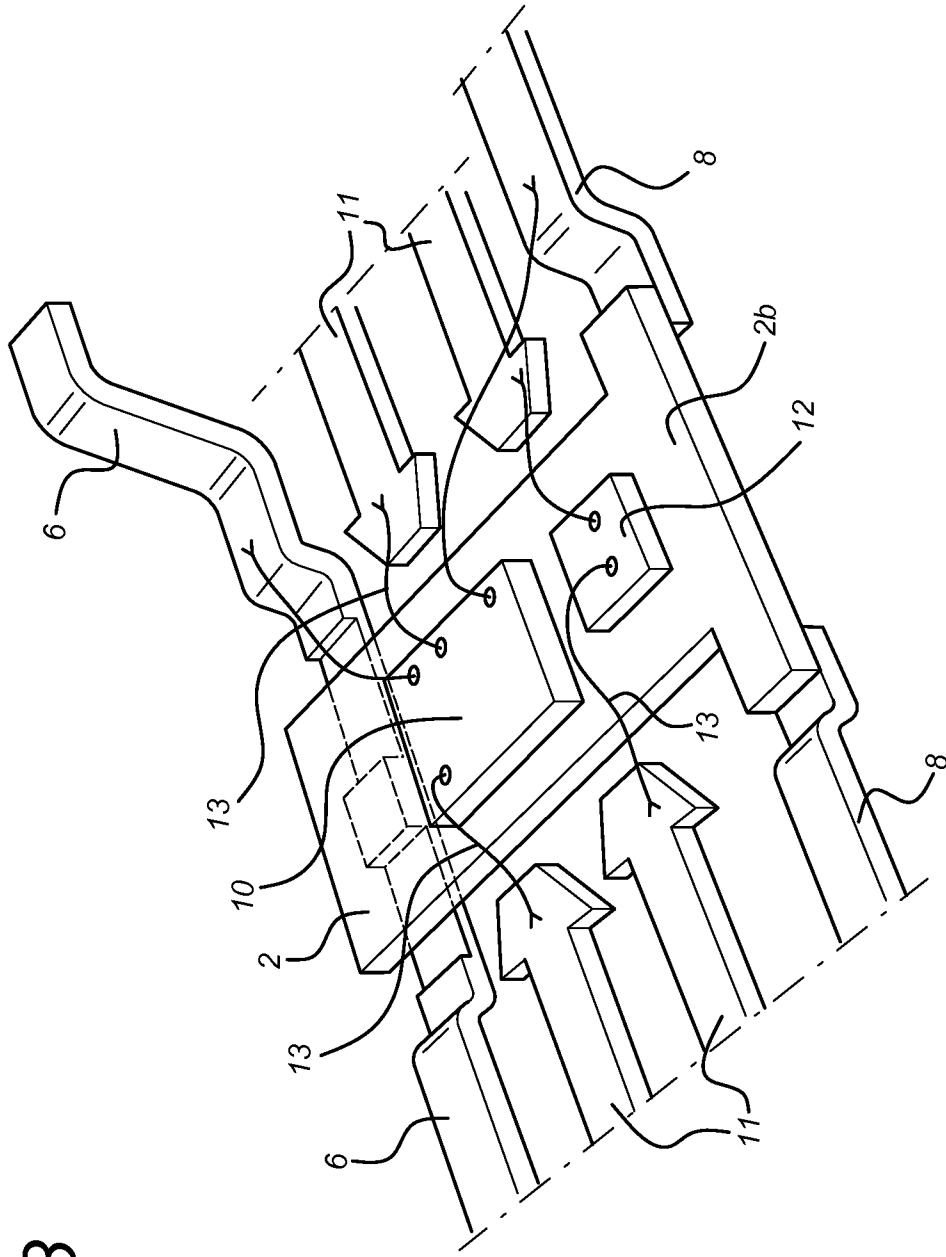
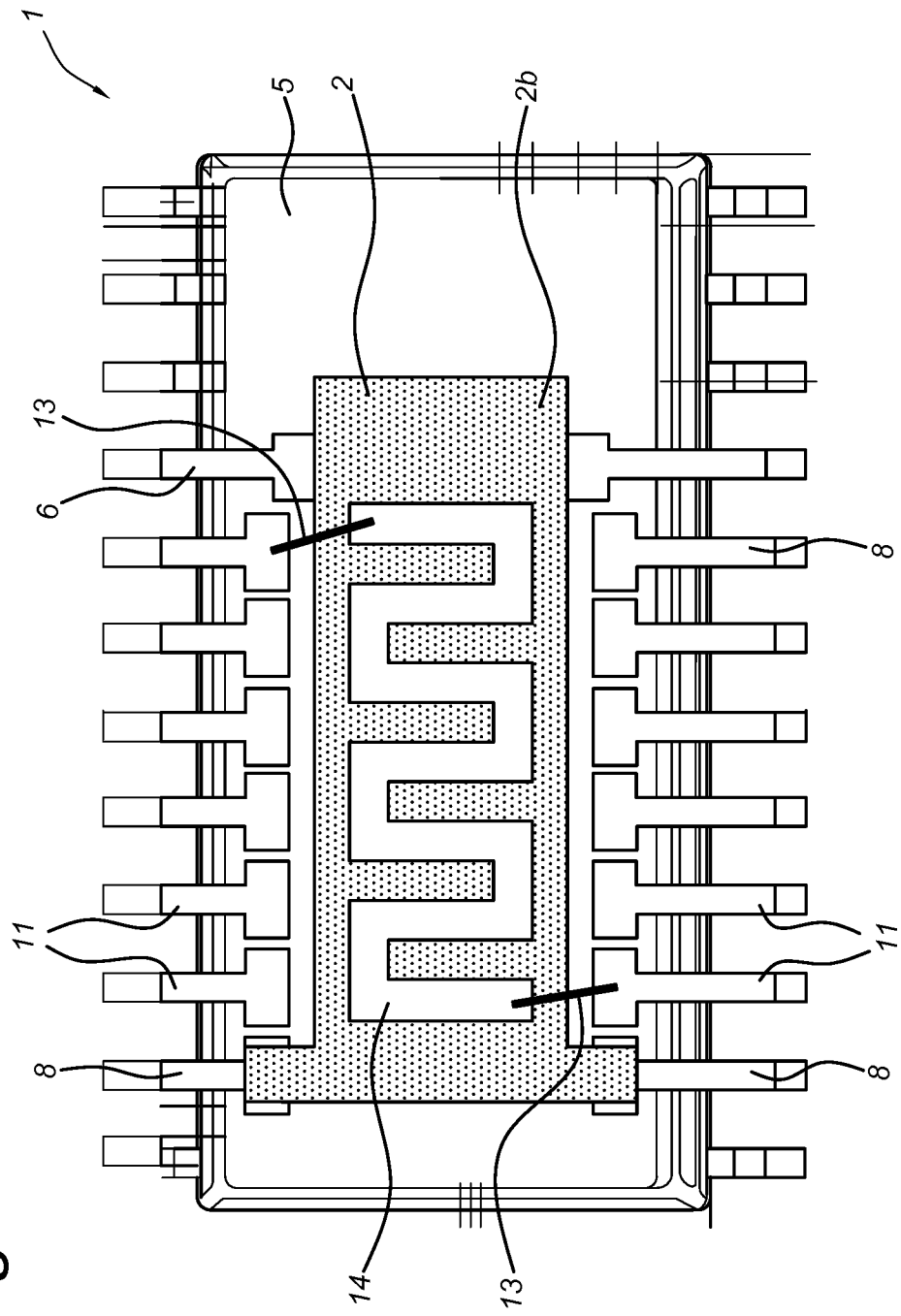


Fig. 4



**ABSTRACT**

5 A sensor package (1) with a package body (5) enclosing at least in part a substrate (2) and a plurality of lead frame members (6, 8). The substrate (2) has a first sensor element (3) on a first side surface (2a). The package body (5) comprises an aperture (5a) exposing a sensitive surface (4) of the first sensor element (3). Electrically conductive glue connections (7, 9) are provided between contact terminals of the first sensor element (3) and one or more of the plurality of lead frame members (6, 8).

10

[Fig. 1A]

## SAMENWERKINGSVERDRAG (PCT)

### RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
	<b>P6064868NL</b>
Nederlands aanvraag nr.	Indieningsdatum
<b>2017885</b>	<b>29-11-2016</b>
	Ingeroepen voorrangsdatum
Aanvrager (Naam)	
<b>Sencio B.V.</b>	
Datum van het verzoek voor een onderzoek van internationaal type	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr.
<b>24-12-2016</b>	<b>SN68050</b>
<b>I. CLASSIFICATIE VAN HET ONDERWERP</b> (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)	
Volgens de internationale classificatie (IPC)	
<b>G01D11/24</b>	
<b>II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK</b>	
Onderzochte minimumdocumentatie	
Classificatiesysteem	Classificatiesymbolen
<b>IPC</b>	<b>G01D</b>
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen.	
<b>III.</b>	<input type="checkbox"/> <b>GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES</b> (opmerkingen op aanvullingsblad)
<b>IV.</b>	<input type="checkbox"/> <b>GEBREK AAN EENHEID VAN UITVINDING</b> (opmerkingen op aanvullingsblad)

**ONDERZOEKSRAPPORT BETREFFENDE HET  
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND  
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar  
de stand van de techniek

NL 2017885

<p>A. CLASSIFICATIE VAN HET ONDERWERP INV. G01D11/24 ADD.</p> <p>Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.</p>														
<p>B. ONDERZOCHETE GEBIEDEN VAN DE TECHNIEK</p> <p>Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen) G01D</p> <p>Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen</p> <p>Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden) EPO-Internal</p>														
<p>C. VAN BELANG GEACHTE DOCUMENTEN</p> <table border="1"> <thead> <tr> <th>Categorie *</th> <th>Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages</th> <th>Van belang voor conclusie nr.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>EP 2 315 011 A1 (CITIZEN FINETECH MIYOTA CO LTD [JP]) 27 april 2011 (2011-04-27) * alinea's [0001], [0006], [0019], [0041] - [0052], [0055], [0075], [0076], [0080], [0111]; figuren 1-4,10,11 *</td> <td>1,3-12</td> </tr> <tr> <td>X</td> <td>DE 10 2008 015709 A1 (INFINEON TECHNOLOGIES AG [DE]) 6 november 2008 (2008-11-06) * alinea's [0020] - [0040]; figuren 1,3-6,8 *</td> <td>1,2,5,6,8,10,12</td> </tr> <tr> <td>X</td> <td>US 2015/345994 A1 (MASE MAKOTO [JP]) 3 december 2015 (2015-12-03) * het gehele document *</td> <td>1,10</td> </tr> </tbody> </table> <p style="text-align: center;">-/--</p>			Categorie *	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.	X	EP 2 315 011 A1 (CITIZEN FINETECH MIYOTA CO LTD [JP]) 27 april 2011 (2011-04-27) * alinea's [0001], [0006], [0019], [0041] - [0052], [0055], [0075], [0076], [0080], [0111]; figuren 1-4,10,11 *	1,3-12	X	DE 10 2008 015709 A1 (INFINEON TECHNOLOGIES AG [DE]) 6 november 2008 (2008-11-06) * alinea's [0020] - [0040]; figuren 1,3-6,8 *	1,2,5,6,8,10,12	X	US 2015/345994 A1 (MASE MAKOTO [JP]) 3 december 2015 (2015-12-03) * het gehele document *	1,10
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<p><input checked="" type="checkbox"/> Verdere documenten worden vermeld in het vervolg van vak C.      <input checked="" type="checkbox"/> Leden van dezelfde octrooifamilie zijn vermeld in een bijlage</p>														
<p>* Speciale categorieën van aangehaalde documenten</p> <p>"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft</p> <p>"D" in de octrooiaanvraag vermeld</p> <p>"E" eerdere octrooi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven</p> <p>"L" om andere redenen vermelde literatuur</p> <p>"O" niet-schriftelijke stand van de techniek</p> <p>"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur</p> <p>"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwaarlijk is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding</p> <p>"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur</p> <p>"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht</p> <p>"Z" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie</p>														
<p>Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid</p> <p>9 maart 2017</p>		<p>Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type</p>												
<p>Naam en adres van de instantie</p> <p>European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040 Fax: (+31-70) 340-3016</p>		<p>De bevoegde ambtenaar</p> <p>Stobbelaar, Mark</p>												



**ONDERZOEKSRAPPORT BETREFFENDE HET  
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND  
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar  
de stand van de techniek

NL 2017885

C. (Vervolg). VAN BELANG GEACHTE DOCUMENTEN		
Categorie *	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A	US 2011/175598 A1 (DOERING ANDREAS [DE] ET AL) 21 juli 2011 (2011-07-21) * alinea's [0024], [0044], [0062]; figuur 2 *	1-12

**ONDERZOEKSRAPPORT BETREFFENDE HET  
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND  
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar  
de stand van de techniek

NL 2017885

In het rapport genoemd octrooigeeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
EP 2315011	A1	27-04-2011	CN 102112869 A 29-06-2011
			EP 2315011 A1 27-04-2011
			JP 5236382 B2 17-07-2013
			JP 2010038575 A 18-02-2010
			US 2011126612 A1 02-06-2011
			WO 2010013727 A1 04-02-2010
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DE 102008015709	A1	06-11-2008	DE 102008015709 A1 06-11-2008
			US 2008236278 A1 02-10-2008
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US 2015345994	A1	03-12-2015	CN 105136017 A 09-12-2015
			DE 102015006602 A1 03-12-2015
			JP 2015225006 A 14-12-2015
			US 2015345994 A1 03-12-2015
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US 2011175598	A1	21-07-2011	CN 102171016 A 31-08-2011
			DE 102008064046 A1 08-04-2010
			EP 2349672 A1 03-08-2011
			KR 20110082150 A 18-07-2011
			US 2011175598 A1 21-07-2011
			WO 2010037810 A1 08-04-2010
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## WRITTEN OPINION

File No. SN68050	Filing date (day/month/year) 29.11.2016	Priority date (day/month/year)	Application No. NL2017885
International Patent Classification (IPC) INV. G01D11/24			
Applicant Sencio B.V.			

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 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 application
- Box No. VIII Certain observations on the application

Examiner Stobbelaar, Mark
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## WRITTEN OPINION

Application number  
NL2017885

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### Box No. I Basis of this opinion

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1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:
    - a sequence listing
    - table(s) related to the sequence listing
  - b. format of material:
    - on paper
    - in electronic form
  - c. time of filing/furnishing:
    - contained in the application as filed.
    - filed together with the application in electronic form.
    - furnished subsequently for the purposes of search.
3.  In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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### Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

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#### 1. Statement

Novelty	Yes: Claims	4, 9
	No: Claims	1-3, 5-8, 10-12
Inventive step	Yes: Claims	
	No: Claims	1-12
Industrial applicability	Yes: Claims	1-12
	No: Claims	

#### 2. Citations and explanations

**see separate sheet**

WRITTEN OPINION

Application number  
NL2017885

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**Box No. VII Certain defects in the application**

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see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1 Reference is made to the following documents:

- D1 EP 2 315 011 A1 (CITIZEN FINETECH MIYOTA CO LTD [JP])  
27 april 2011 (2011-04-27)
- D2 DE 10 2008 015709 A1 (INFINEON TECHNOLOGIES AG [DE])  
6 november 2008 (2008-11-06)
- D3 US 2015/345994 A1 (MASE MAKOTO [JP]) 3 december 2015  
(2015-12-03)
- D4 US 2011/175598 A1 (DOERING ANDREAS [DE] ET AL) 21 juli  
2011 (2011-07-21)

2 Independent claims 1 an 10

2.1 Document EP 2315011 discloses a sensor package comprising

a package body 1 enclosing at least in part a substrate 2 (mounting base 2: D1, Fig.10) and a plurality of lead frame members 51 - 58 (see Figs. and corresponding paragraphs),

wherein the substrate 2 comprises a gas sensor 7 mounted on a first side surface (D1, Fig.3) and

wherein the package body 1 comprises an aperture 11a exposing a sensitive surface of the gas sensor 7 (D1, [0041]-[0042]), and

wherein the sensor package further comprises an electrically conductive glue connection between contact terminals of the gas sensor and the plurality of lead frame members 51 - 58 (D1, [0080], [0111]).

Consequently the subject-matter of independent apparatus claim 1 and accordingly of independent method claim 10 is not new in view of D1.

2.2 Additionally it is noted, that also in view of the teachings of D2 the subject-matter of independent claim 1 and accordingly of independent claim 10 is not new. Namely, D2 discloses a sensor package 100, 300, 400, 500 comprising a package body 3 enclosing at least in part a substrate in the form of a sensor chip 1 inside a structure 2, and a plurality of lead frame members 6, wherein the sensor chip 1 comprises a sensor element on a surface of the

sensor chip, and wherein the package body 3 comprises an aperture exposing a sensitive surface of the sensor element (D2, [0018], [0020] and Fig.1, embodiment with structure 2 only partly covering the sensor chip), and wherein the sensor package 100 further comprises an electrically conductive glue connection between a contact terminal of the sensor chip 1 inside the structure 2 and lead frame member 6 (D2, [0025]).

3 Dependent claims 2 - 9 and 11 - 12

Dependent claims 2 - 9 and 11 - 12 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements with respect to novelty and/or inventive step, the features being known from D1 - D4 and/or forming obvious technical solutions for the skilled person to solve the problems posed:

Claim 2: see D2, [0025] and Figs 3 - 6.

Claims 3 and 4: see D1, [0001].

Claims 5, 6 and 12: see D1, Figs 3 and 5: additional component 8 on other side of shield 9 on substrate 2, connected to other lead frame members .

Claims 7 and 9: see D1, [0055].

Claim 8: use of an IC is an evident possibility for the skilled person, also in the field of sensors, see for example D3, [0035] or D4, [0024].

Claim 11: see D1, [0075] - [0076].

**Re Item VII**

**Certain defects in the application**

- 1 The relevant background art disclosed in D1 - D4 is not mentioned in the description, nor are these documents identified therein.
- 2 Independent claims 1 and 10 are not in the two-part form, which in the present case would be appropriate, with those features known in combination from the prior art document D1 (see Item V, point 2.1) being placed in the preamble and the remaining features being included in the characterising part.