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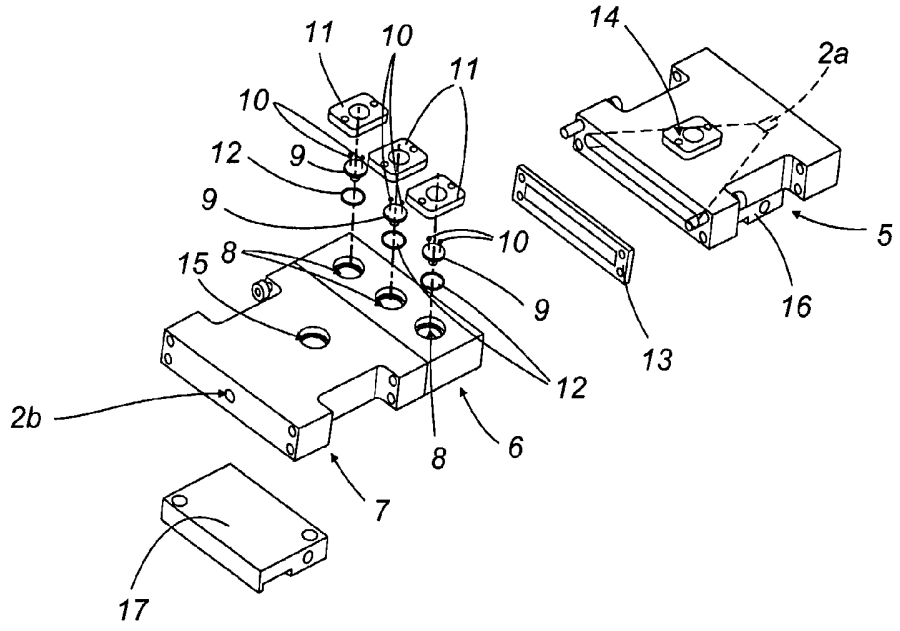
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[Continued on next page]

(54) Title: A GAS SENSOR CHAMBER AND ODOUR DETECTION METHOD



(57) Abstract: The invention relates to a chamber (2) for gas sensors (9) to be used in a device (1) for detecting aromas or odours. The chamber (2) comprises three portions (5, 6, 7) in which there is a uniform, turbulence-free flow (F) of gas or vapours to be analysed, and at least one gas sensor (9) positioned in the central portion in such a way as to be immersed in and to laterally and tangentially interact with the flow (F). The chamber (2) also comprises a heating and temperature regulating device (16, 17). The invention also relates to an odour detection method which comprises a step in which a uniform, turbulence-free flow (F) of gas or vapour interacts with a gas sensor (9) laterally and tangentially.

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Description

A gas sensor chamber and odour detection method

Technical field

The present invention relates to a gas sensor chamber and an odour detection method that uses the chamber according to the invention.

One non-limiting example of an application of the chamber according to the invention is in apparatus for detecting aromas or odours produced by food products. This specification expressly refers to uses of this kind but without thereby restricting the scope of the invention.

Background art

Apparatus for detecting the aromas or odours produced by food products is used to check the quality of a food product not only in terms of the constancy of its properties during the preparation process but also to detect ageing or spoiling.

This type of check is very useful because it provides information quickly without having to come into contact with the product to be checked.

Devices are known which detect aromas or odours using artificial sensors that work in a manner similar to the olfactory system of mammals.

Chemical resistors are one example of sensors of this kind. This type of sensor is made from special materials that absorb the gas/vapour to be detected and produce a change in electrical resistance.

The substance absorbed by the sensor material produces a change in the resistance to the passage of current through an electrical circuit to which the sensor is connected.

Usually, the sensors used for olfactory measurement analysis are transducers which convert an interaction with defined gaseous

substances into electrical signals.

Each sensor is differently sensitive to a specific group of gaseous substances and therefore, to produce an "odour print", that is to say, a specific aroma or odour, with satisfactory precision, several olfactory sensors are required, each differently sensitive to that specific group of gaseous substances.

Further, once the sensors used to identify gas mixtures have generated a certain signal, they must be cleared of the gas they have absorbed before they can proceed to carrying out another analysis.

It follows that the arrangement of the sensors and the shape of the chamber in which the sensors are located are very important factors for the correct identification of the odour or aroma.

One gas sensor arrangement is known from patent US-B2-6 516 653.

That document describes an apparatus device comprising one or more gas or vapour sensors located in a room where concentrations or mixtures of gases or vapours have to be monitored, and with a diffusion body placed in front of the sensors.

According to the invention described in that document, the gas sensors, whose responsiveness is influenced by the design of the container enclosing the space to be monitored, by contamination or by static conditions in the space to be monitored, are positioned in a duct where a flow that accelerates the diffusion of the gases or vapours to be analysed is generated, thus increasing the responsiveness of the gas sensors.

Disclosure of the invention

One aim of the present invention is to provide an improved gas sensor chamber permitting optimum operation of the gas sensors.

Another aim of the present invention is to provide a gas sensor chamber housing one or more sensors in such a way that all the sensors are in the same detection conditions.

A further aim of the present invention is to provide a gas

sensor chamber permitting rapid detection of the signals produced by the gaseous substances and fast resetting of the sensors so they are ready to carry out the next analysis.

According to one aspect of it, the present invention provides a gas sensor chamber as defined in claim 1.

Yet another aim of the present invention is to provide an improved method for detecting odours in which a uniform flow of the gases or vapours to be analysed is made to interact laterally and tangentially with the gas sensors.

According to another aspect of it, the present invention provides a gas detection method as defined in claim 18.

The dependent claims describe preferred, advantageous embodiments of the invention.

Brief description of the drawings

The preferred embodiments of the invention will now be described, without restricting the scope of the inventive concept, with reference to the accompanying drawings in which:

Figure 1 is an axonometric view of an odour detection device equipped with a gas sensor chamber made according to the present invention;

Figure 2 is a schematic section view of the gas sensor chamber made according to the present invention;

Figure 3 is a schematic axonometric view of the gas sensor chamber illustrated in the figures listed above;

Figure 4 is a schematic section view of another embodiment of the gas sensor chamber according to the present invention;

Figure 5 is an axonometric view of a constructional form of the gas sensor chamber according to the present invention; and

Figure 6 is a longitudinal section view of the gas sensor chamber illustrated in Figure 5.

Detailed description of the preferred embodiments of the invention

With reference to the accompanying drawings, the odour detection device equipped with the gas sensor chamber according to the invention is denoted in its entirety by the numeral 1.

The device 1 essentially comprises a gas sensor chamber 2

and a diverter valve 3 with two connections - a first connection to a zone in which the product to be checked is located and a second connection to a neutral reference gas - and a pump 4 to suck the reference gas or the air from the zone where the product to be checked is located.

The diverter valve 3 and the suction pump 4 do not form part of the subject-matter of the present invention and, for this reason, are illustrated schematically in Figure 1.

As shown in the drawings, the chamber 2 comprises an inlet 2a and an outlet 2b for the flow F of gas or vapour to be analysed, a divergent portion 5, a central sensor mounting portion 6 and a convergent portion 7.

The central portion 6 has a total internal height H and presents a lateral surface 6a, of width L, on which there is at least one hole 8 with a respective gas sensor 9 fitted in it. The sensor 9 has a sensitive surface 10 located inside the central portion 6 in such a way as to interact tangentially with the flow F of gas or vapours to be analysed. More specifically, as illustrated in Figure 2, the sensitive surface 10 is located approximately a third of the way up or down the total height H of the central portion 6.

The central portion 6 has an elongate, rectangular shaped cross section so as to maximise the ratio of the area of the lateral surface 6a to the internal volume.

According to a preferred embodiment of the invention, the central portion 6 houses six gas sensors 9 arranged in groups of three along the top and bottom of the long sides of the lateral surface 6a in a direction transversal to the flow F of gas or vapours to be analysed.

As mentioned above, the sensitive surfaces 10 of the sensors 9 at the top are located about a third of the way down the total height H of the central portion 6, whilst the surfaces 10 of the sensors 9 at the bottom are located about a third of the way up the total height H of the central portion 6.

In this way, the sensitive surfaces 10 of the sensors 9 all interact with the flow F in the same way and without interfering with each other. Since each sensor 9 is differently sensitive to a

specific odorous mixture, this arrangement makes it possible to identify the odour print in a precise and repeatable manner.

The elongate flattened shape of the central portion 6, with a height H that is relatively small compared to its width L, is advantageous for rapid detection of the odour or aroma because it minimises the volume or gas or vapour to be analysed relative to the size of the sensitive surfaces 10 of the sensors 9, thus allowing a high concentration of odour or aroma inside the chamber 2.

The ratio of the width L to the height H (L/H) of the central portion 6 may be between 8 and 12 and is preferably 9.

The sensitive surface 10 of each sensors 9 - since it is inside the central portion 6 approximately a third of the way along the height H - interacts in optimum manner with the flow F of the gas or vapour and is not disturbed by the lateral surface 6a of the central portion 6.

In the preferred embodiment, there are six sensors. This is a purely exemplary number and is a compromise between the need to precisely identify the odour print and the cost and size of the odour detection device in its entirety.

It will therefore be understood that sensor chambers 2 according to the invention can be made with a larger or smaller number of sensors without departing from the scope of the inventive concept as defined in the claims.

As illustrated in Figure 5, each sensor 9 is fixed to the central portion 6 by a plate 11 and screws, and also has a seal 12, such as an O-ring, to prevent infiltration of air from the outside environment. The holes 8 in which the sensors 9 are fitted are shape or size coded so that each sensor has a fixed position in the chamber 2 and cannot be changed round with any of the others. For example, the holes 8 may have a different diameter and/or geometrical shape, matching the diameter and/or shape of the couplings on the respective sensors 9.

The divergent portion 5 connects the inlet 2a, which is normally circular, with the central portion 6, which has an elongate cross section.

The divergent portion 5 must also create a flow of gas or

vapour that is as uniform and free of turbulence as possible.

To achieve this, the divergent portion 5 has a flattened conical shape with an angle α of less than 12 degrees at the vertex of the cone. Larger angles α - around 50 degrees - are also possible but, in this case, a diffuser or uniformizer 13 must be fitted to correctly address or redirect the gas flow.

As a result, the cone angle α of the divergent portion 5 may fall within either of two possible ranges: angle α from 0 to 12 degrees without diffuser or uniformizer 13, or angle α from 40 to 65 degrees with diffuser or uniformizer 13.

In a preferred embodiment with diffuser or uniformizer, the cone angle α is 52 degrees.

The flow diffuser or uniformizer 13 may be made from fine metallic mesh which straightens and uniformizes the passage of the flow F into the central portion 6.

The flow diffuser 13 presents an open area between 30 and 40% with a mesh size of between 300 and 500 µm (microns). In a preferred embodiment, the open area is 35% and the mesh size 380 µm (microns).

Alternatively, porous polymer membranes may be used, even ones capable of filtering out specific gaseous substances.

The novel feature of this chamber is the way in which the gas or vapour flow F interacts with the sensors 9, namely, laterally and tangentially, enabling the sensors 9 to work better.

That is because the interaction between the sensors 9 and the gases analysed occurs through a reaction on the surface of the sensors 9 and, consequently, tangential flow maximises the responsiveness of the sensors 9.

Figure 4 illustrates an embodiment of the chamber 2 where the lateral surface 6a has smooth, rounded corners and edges all the way around it.

The convergent portion 7 may be made with the same geometrical characteristics as the divergent portion 5, which means that the two portions 5 and 7 may be identical, with obvious advantages in terms of production cost.

The portions 5, 7 may also have housings 14, 15 for other sensors, such as, for example, sensors to detect temperature and

relative humidity in the chamber 2.

In fact, it should be remembered that for optimum operation, the sensors 9 may need to be heated and that, since the temperature and relative humidity in the chamber 2 affect the precision of odour detection, it is necessary to know and, if possible, control and modify these conditions in the chamber 2. To maintain uniform detection conditions, the chamber 2 may have heat insulation and the divergent and convergent portions 5, 7 may be equipped with heaters 16, 17 attached to said portions 5, 7.

The heaters 16, 17 thus constitute a device for heating and regulating the temperature of the chamber 2 and may be based on embedded resistors or cartridges.

The materials from which the chamber 2 is made must have good properties of inertia and resistance to absorption of aromas and odours so as not to affect detection by the sensors 9. They must also have a good resistance to relatively high temperatures.

That is because certain types of sensors 9 must be heated to temperatures of around 300-500 degrees Celsius to work efficiently. The chamber 2 may thus need to be heated by the heaters 16, 17 to temperatures around 50 - 80 degrees Celsius.

For these reasons, the chamber 2 may be made, for example, from stainless steel, type AISI 304, and the seals between the different parts of the chamber 2 may be made from polytetrafluoroethylene, usually known as Teflon, a registered trademark of the Du Pont company.

The invention also concerns an odour detection method comprising the following steps:

sucking in the gas or vapour to be analysed from the area where the product is located;

generating a uniform turbulence-free flow F of gas or vapour into a sensor mounting portion 6;

making the flow F of gas or vapour interact laterally and tangentially with sensors 9;

collecting the signals generated by the sensors 9 and processing them to define the odour print of the gas or vapour to be analysed;

sucking in a neutral reference gas;

generating a uniform turbulence-free flow F of the neutral reference gas into the sensor mounting portion 6;

making the flow F of reference gas interact laterally and tangentially with the sensors 9 so as to clear the previously analysed gas or vapour from the sensors 9 and make the sensors 9 ready to carry out the next analysis.

The odour detection method also comprises steps of measuring temperature and of controlling the temperature by heating the sensors 9 and the chamber 2.

The invention has important advantages.

The chamber according to the invention is made in such a way that all the sensors 9 interact simultaneously with the same flow of gas or vapour to be analysed, the flow, in all cases, varying very little from sensor to sensor.

The chamber according to the invention is shaped to permit quick and easy clearing after each analysis carried out.

The volume of the gas or vapour sample to be analysed is reduced in relation to the geometrical and constructional constraints due to the sensors, pipe fittings and electrical connectors.

Chamber design is such that each sensor has a single, well-defined and easily identifiable mounting position.

The heat insulation, made to the measure of the chamber 2, and the embedded resistor or cartridge heating system create constantly optimum conditions for detection.

The compact shape of the chamber 2 can be reduced in size without altering its geometry and leaving unchanged the advantages described above.

The invention as described above may be modified and adapted in several ways without thereby departing from the scope of the inventive concept as defined in the claims.

Moreover, all the details of the invention may be substituted by technically equivalent elements.

Claims

1. A chamber (2) for gas sensors (9) to be used in a device (1) for detecting aromas or odours, comprising a container in which there is a flow (F) of gas or vapours to be analysed, the flow (F) flowing in through an inlet (2a) and out through an outlet (2b) of the chamber (2), and at least one gas sensor (9) having a sensitive surface (10) and mounted in the chamber (2) in such a way as to detect a signal used to identify the flow of gas or vapour to be analysed, characterised in that the sensor (9) is positioned in such a way as to be immersed in and to laterally interact with the flow (F).

2. The chamber (2) for gas sensors (9) according to claim 1, wherein the sensitive surface (10) of each gas sensor (9) is positioned in such a way as to laterally and tangentially interact with the flow (F).

3. The chamber (2) for gas sensors (9) according to claim 1 or 2, comprising a central portion (6) having a total internal height (H) and a lateral surface (6a), of width (L), on which there is at least one hole (8) with a respective gas sensor (9) fitted in it.

4. The chamber (2) for gas sensors (9) according to claim 3, wherein the central portion (6) has a width (L) to height (H) ratio (L/H) between 8 and 12.

5. The chamber (2) for gas sensors (9) according to claim 3, wherein the central portion (6) has a width (L) to height (H) ratio (L/H) equal to 9.

6. The chamber (2) for gas sensors (9) according to any of the foregoing claims from 3 to 5, wherein the sensitive surface (10) of the sensor (9) is positioned approximately a third of the way along the height (H) of the central portion (6).

7. The chamber (2) for gas sensors (9) according to any of the foregoing claims from 3 to 6, comprising a divergent portion (5) having a flattened conical shape with an angle α at the vertex of the cone, the portion (5) connecting the inlet (2a) to the central portion (6).

8. The chamber (2) for gas sensors (9) according to claim 7, wherein the divergent portion (5) has a cone angle α between 0 and 12 degrees.

9. The chamber (2) for gas sensors (9) according to claim 7, wherein the divergent portion (5) has a cone angle α between 40 and 65 degrees, and the chamber (2) further comprising a diffuser or uniformizer (13) located between the divergent portion (5) and the central portion (6).

10. The chamber (2) for gas sensors (9) according to claim 9, wherein the divergent portion (5) has a cone angle α equal to 52 degrees.

11. The chamber (2) for gas sensors (9) according to claim 9 or 10, wherein the diffuser or uniformizer (13) is made from fine metallic mesh which straightens and uniformizes the passage of the flow (F) into the central portion (6).

12. The chamber (2) for gas sensors (9) according to any of the foregoing claims from 9 to 11, wherein the flow diffuser or uniformizer (13) has an open area between 30 and 40% and a mesh size between 300 and 500 μm (microns).

13. The chamber (2) for gas sensors (9) according to any of the foregoing claims from 9 to 11, wherein the flow diffuser or uniformizer (13) has an open area of 35% and a mesh size of 380 μm (microns).

14. The chamber (2) for gas sensors (9) according to any of the foregoing claims from 9 to 11, wherein the flow diffuser or

uniformizer (13) is made from porous polymer membranes, even ones capable of filtering out specific gaseous substances.

15. The chamber (2) for gas sensors (9) according to any of the foregoing claims from 3 to 14, comprising a convergent portion (7) having a flattened conical shape, the convergent portion (7) connecting the central portion (6) to the outlet (2b).

16. The chamber (2) for gas sensors (9) according to any of the foregoing claims from 9 to 15, wherein the convergent portion (7) is the same as the divergent portion (5).

17. The chamber (2) for gas sensors (9) according to any of the foregoing claims, comprising a heating and temperature regulating device (16, 17).

18. An odour detection method comprising the following steps:

sucking in the gas or vapour to be analysed from the area where the product to be checked is located;

generating a uniform turbulence-free flow (F) of gas or vapour into a sensor mounting portion (6);

making the flow (F) of gas or vapour interact laterally and tangentially with at least one sensor (9);

collecting the signals generated by the at least one sensor (9) and processing them to define the odour print of the gas or vapour to be analysed;

sucking in a neutral reference gas;

generating a uniform turbulence-free flow (F) of the neutral reference gas into the sensor mounting portion (6);

the method being characterised in that it comprises the step of making the flow (F) of reference gas interact laterally and tangentially with the at least one sensor (9) so as to clear the previously analysed gas or vapour from the at least one sensor (9) and make the at least one sensor (9) ready to carry out the next analysis.

19. The odour detection method according to claim 18, characterised in that it comprises a step of measuring the temperature and of controlling the temperature by heating the chamber (2).

20. The odour detection method according to claim 18, characterised in that it comprises a step of measuring the relative humidity and a step of controlling the humidity by pre-treating the flow of gas or vapour introduced into the chamber (2).

FIG.1

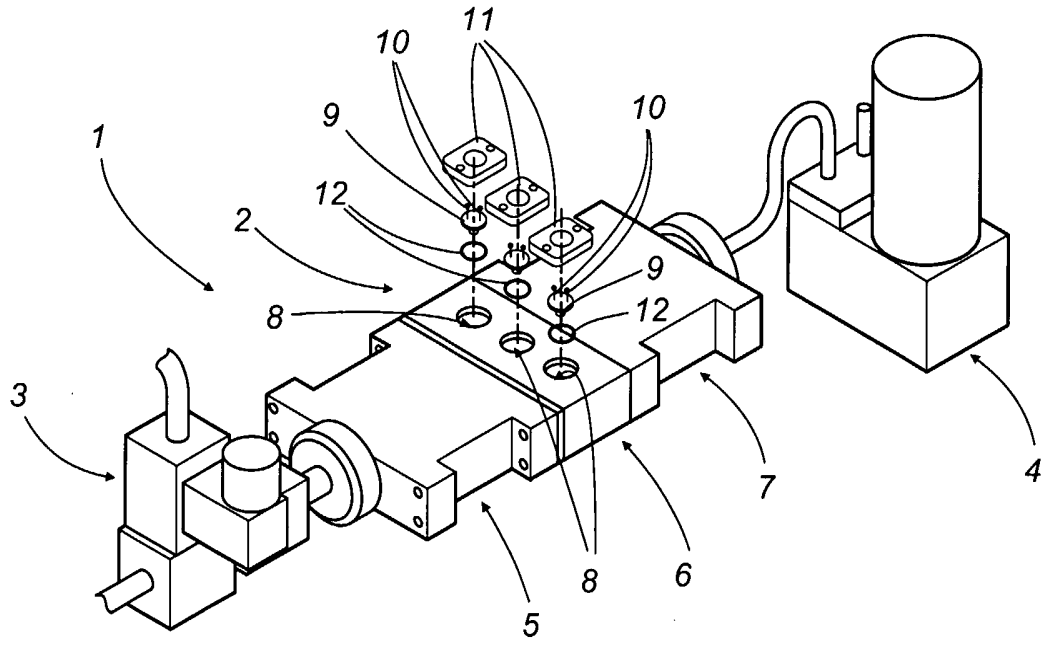


FIG.2

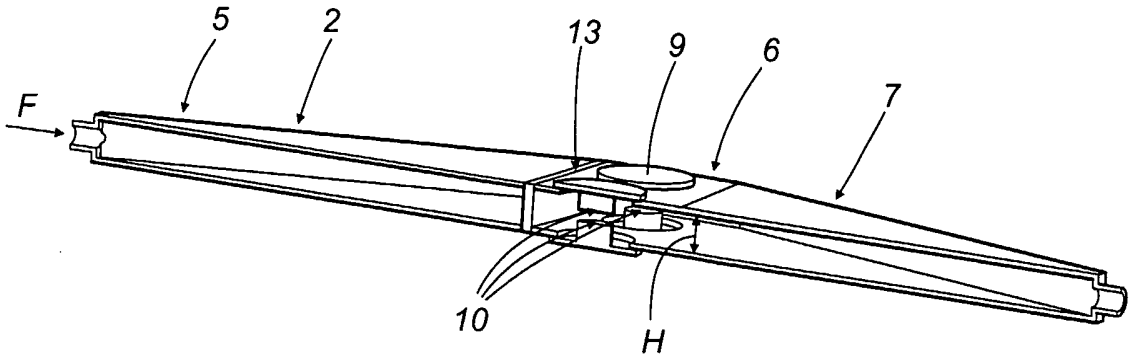


FIG.3

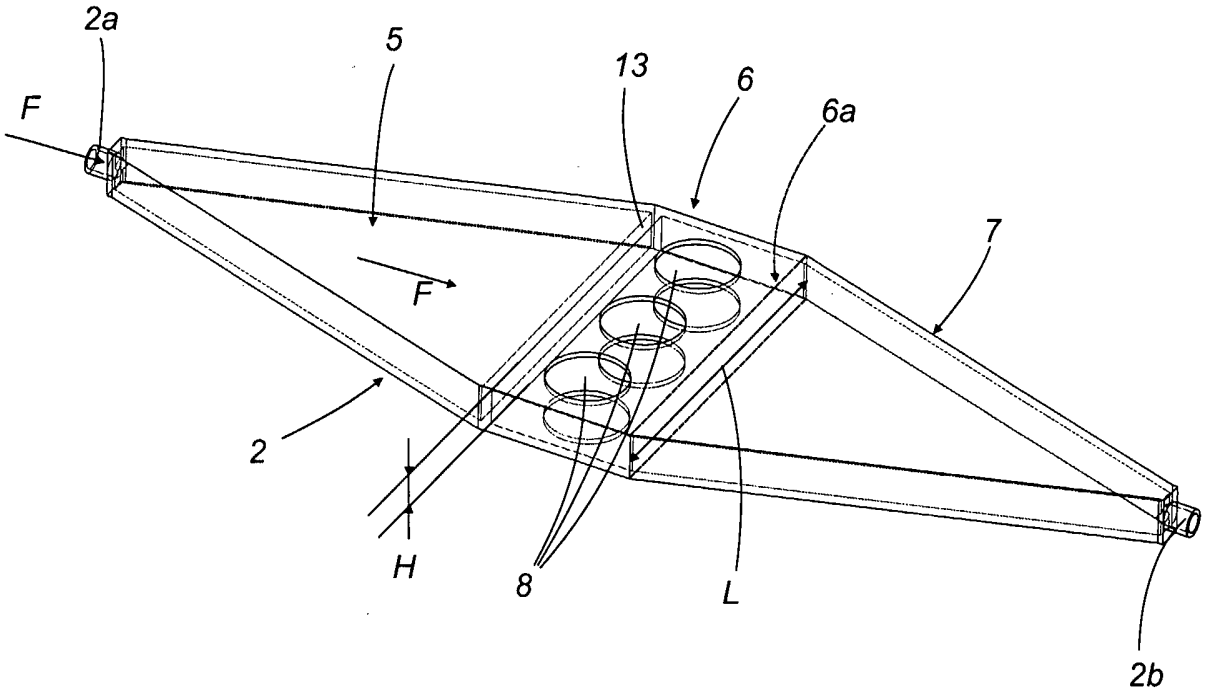


FIG.4

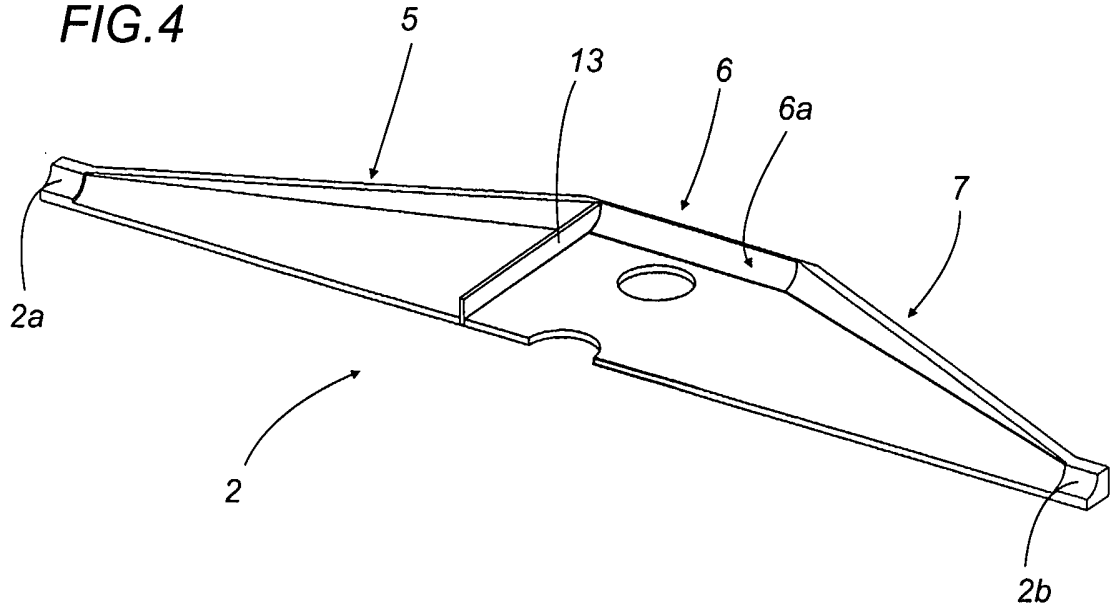


FIG.5

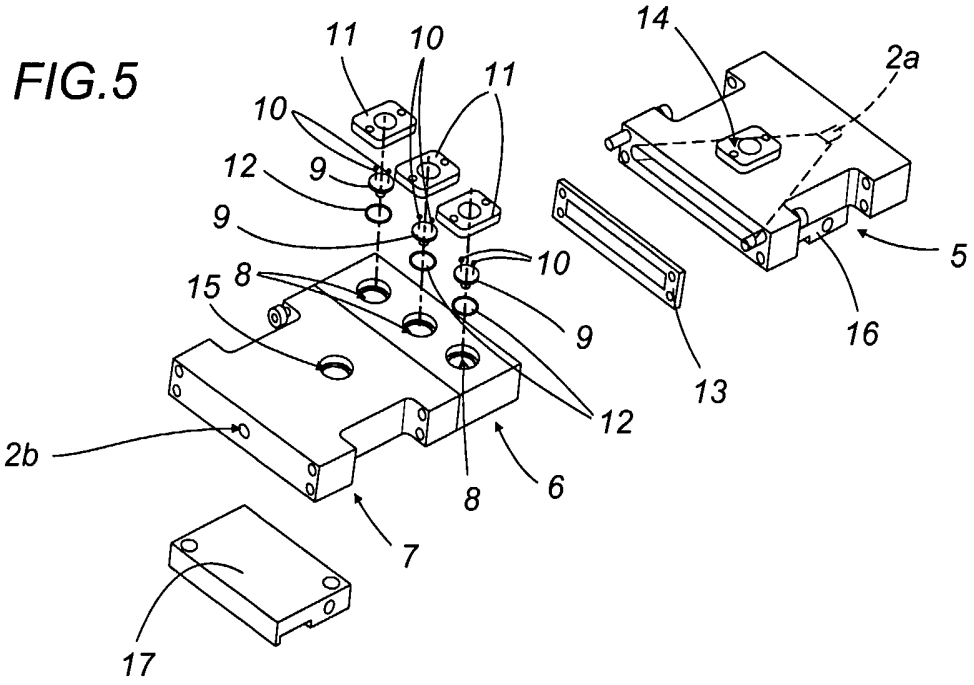
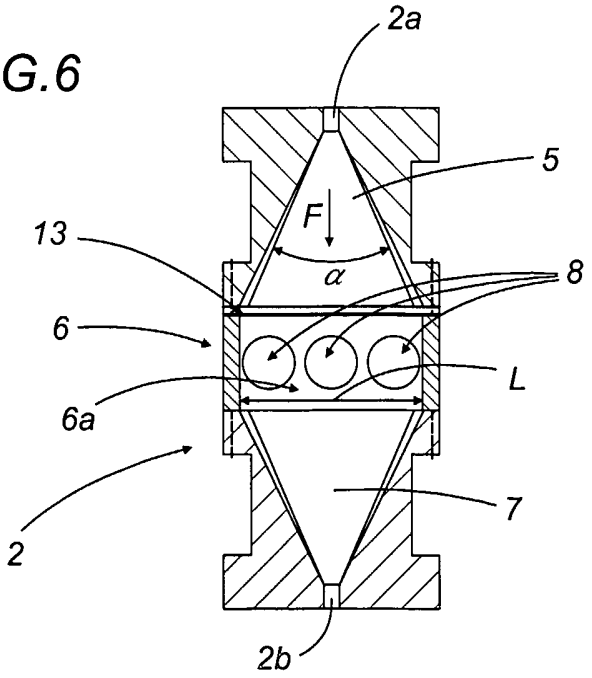

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FIG.6


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INTERNATIONAL SEARCH REPORT

national Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01N33/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 2002/002857 A1 (KITA JUNICHI ET AL) 10 January 2002 (2002-01-10) paragraphs '0122!,'0023!,'0046!-'0058!; figures 1,3	1-5,18 19,20
X Y	US 2002/092339 A1 (BYUN HYUNG-GI ET AL) 18 July 2002 (2002-07-18) paragraphs '0004!,'0018!,'0055!; figures 1,4A,4B	1-5,17 19,20
X A	US 2002/124631 A1 (BOEHR CHRISTOPHER K ET AL) 12 September 2002 (2002-09-12) paragraphs '0003!,'0063!-'0065!; figures 7A,7B,7C	1,2 3-20
X	DE 100 00 738 A (HEINING KAI ;HEINLEIN JOERN (DE)) 19 July 2001 (2001-07-19) the whole document	1,2

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
21 June 2004	28/06/2004

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Wulveryck, J-M

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 01, 29 January 1999 (1999-01-29) & JP 10 267879 A (SHIMADZU CORP), 9 October 1998 (1998-10-09) abstract; figures 1-6	19,20
A	WO 01/23883 A (FARRINGTON AMIEL ;QUALITY SENSOR SYSTEMS LTD (GB)) 5 April 2001 (2001-04-05) page 12 -page 13; figures 1,2	1-3,18

INTERNATIONAL SEARCH REPORT

Information on patent family members

National Application No
PCT/IB2004/000452

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002002857 A1	10-01-2002	JP 2002022694 A	23-01-2002
US 2002092339 A1	18-07-2002	KR 2001000116 A	05-01-2001
		KR 2001000098 A	05-01-2001
		KR 2001000099 A	05-01-2001
US 2002124631 A1	12-09-2002	US 2001039824 A1	15-11-2001
		US 6234006 B1	22-05-2001
		US 6085576 A	11-07-2000
		US 2004069046 A1	15-04-2004
		US 2001008816 A1	19-07-2001
		AU 756085 B2	02-01-2003
		AU 3105099 A	11-10-1999
		AU 4970600 A	21-09-2000
		CA 2325137 A1	23-09-1999
		CN 1301342 T	27-06-2001
		EP 1171823 A2	16-01-2002
		EP 1064530 A2	03-01-2001
		JP 2003526768 T	09-09-2003
		JP 2002538457 A	12-11-2002
		NZ 507177 A	26-09-2003
		WO 0052444 A2	08-09-2000
		WO 9947905 A2	23-09-1999
		US 6422061 B1	23-07-2002
		US 2002178789 A1	05-12-2002
DE 10000738 A	19-07-2001	DE 10000738 A1	19-07-2001
JP 10267879 A	09-10-1998	NONE	
WO 0123883 A	05-04-2001	AU 7534500 A	30-04-2001
		EP 1214590 A1	19-06-2002
		WO 0123883 A1	05-04-2001
		JP 2003510605 T	18-03-2003