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(54) **METHOD FOR THE MANUFACTURING OF A CARRYING DEVICE, CARRYING DEVICE, SYSTEM FOR DETECTION OF A PHYSICAL PARAMETER AND METHOD FOR DETECTION OF A PHYSICAL PARAMETER**

(57) The invention relates to a method for the manufacturing of a carrying device, a carrying device, a system for detection and a method for detection of at least one physical parameter and/ or chemical composition. A method for the manufacturing of a carrying device for reception of at least one sensor is presented, in which a receiving body with a surface to be coated is provided. In the receiving body, a space is provided which is open on the side of this surface. A second body with a sealing surface is provided. This sealing surface is positioned in such a manner that the surface to be coated of the receiving body is sealed by the second body at least in the circumference of the space in the receiving body. A formable or moldable filling material is provided in the space in such a manner that the filling material forms a surface shaped complementary to the sealing surface of the second body, closing the space. At least the volume of the filling material contacting the sealing surface of the second body is solidified. The sealing surface of the second body is removed from the surface to be coated as well as from the surface provided by the filling material. The surface to be coated is coated such that a membrane is provided, sealing the space.

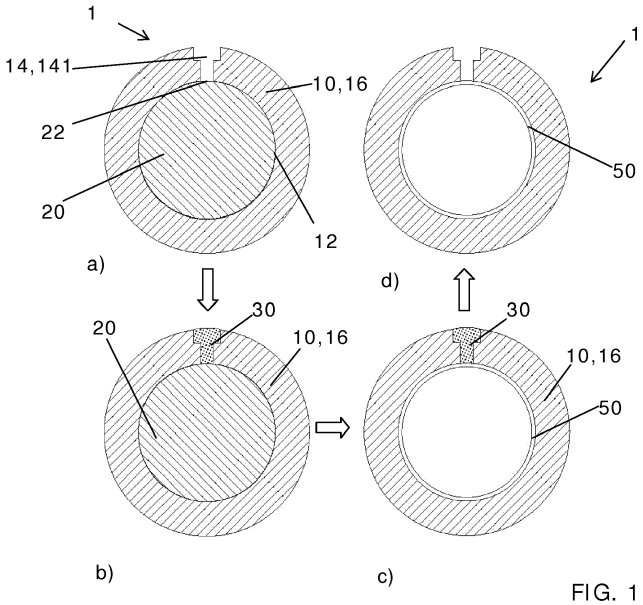

FIG. 1

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Description

[0001] The invention relates to a method for the manufacturing of a carrying device for reception of at least one sensor, a carrying device for reception of at least one sensor, a system for detection and/ or measurement of at least one physical parameter and/ or chemical composition of a medium and a method for detection and/ or measurement of at least one physical parameter and/ or chemical composition of a medium.

[0002] The implementation of a sensor into a hollow space or the presence of such a device in a hollow space entails an impact on the fluid flowing through the hollow space. The measurement from the outside is often prevented by the nature of the enclosure, e. g. thick, rigid or non-transparent walls. As illustration, the measurement of a fluid's pressure flowing within a pipe or tube typically requires the insertion of a wire-guided sensor or placing the sensor in a space within the sidewall. The drawbacks of these techniques are manifold. Depending on the flow conditions, the added geometrical features may locally alter the measured pressure in such a way that it no longer represents the sought-after quantity. The sensor, typically of electronic nature, may require sophisticated packaging in order to be protected from the fluid. On the other hand, in the case of handling sensitive fluids (e. g. of medical or biological nature such as blood), the inclusion of sharp edges or obstructions in form of a sensor may damage the fluid, rendering a sensible measurement impossible altogether.

[0003] It is known that sensors can be directly inserted into fluids contained in hollow spaces. The sensor may be a wireless device, as described in US 20140296740 A1, or tethered via wire, as shown in US 5902248 A. Furthermore it is known to locate sensors outside the body that encloses the hollow space with a conventionally machined membrane between sensor and fluid, as shown in US 6367333 B1.

[0004] Sensor insertion into the fluid may alter the measurement conditions or harm sensitive fluids. Known membranes are limited to thick and/ or planar geometries due to the known fabrication methods.

[0005] A concrete technical problem is the inclusion of pressure sensors into artificial heart pumps (e. g. left ventricular assist devices), which support or replace the heart function of patients with congestive heart failure. In such a device, the obtained pressure signal could be used to monitor the patient's state and/ or to control the left ventricular assist device's pumping speed. Typically, left ventricular assist devices are designed to have as smooth and continuous blood contacting surfaces as possible. Avoiding the formation of small ridges and gaps has proven to be essential in suppressing blood clotting and hemolysis. These features are difficult to avoid for pressure sensors as they require some form of biocompatible, mechanical coupling to the blood. Sensors introduced directly into the fluid are not suitable. Apart from pressure, other fluid properties like temperature or chemical composition (e.g. oxygen saturation of blood) or operation conditions like sedimentation and formation of obstructions are of interest. Aforementioned examples all require some form of physical coupling (e.g. mechanical, thermal or optical) between the inside of the hollow space and the sensor. For a desirable accuracy, sensitivity and robustness of the measurement, the thickness of the coupling is to be minimized, preferably to the micro-range (< 10 μm) or smaller, depending on the application.

[0006] The problem to be solved by the invention is to provide a method for the manufacturing of a carrying device for a sensor, a carrying device for a sensor, a system and a method which allow the detection of a physical parameter and/ or chemical composition without damaging the fluid.

[0007] This problem is solved by the subject matter of the method for the manufacturing of a carrying device for reception of at least one sensor as claimed in claim 1, as well as by a carrying device for reception of at least one sensor, a system for detection and/ or measurement of at least one physical parameter and/ or chemical composition of a medium and a method for detection and/ or measurement of at least one physical parameter and/ or chemical composition of a medium as claimed in claims 8, 12 and 15. Specific embodiments of the invention are claimed by the dependent claims 2-7, 9-11, 13 and 14.

[0008] According to the first aspect of the invention, a method for the manufacturing of a carrying device for reception of at least one sensor is presented, in which a receiving body with a surface to be coated is provided. In the receiving body, a space is provided which is open on the side of this surface. A second body with a sealing surface is provided. The second body may particularly be a solid body or a gas-filled or gas-fillable device that provides a sealing surface. The term "sealing" designates impermeability to liquids and paste-like materials in the context of the sealing surface of the second body. This sealing surface is positioned in such a manner that the surface to be coated of the receiving body is sealed by the second body at least in the circumference of the space in the receiving body. Thereby, the shape of the sealing surface of the second body adapts complementary to the surface to be coated of the receiving body. A formable or moldable filling material is provided in the space in such a manner that the filling material forms a surface shaped complementary to the sealing surface of the second body, closing the space. At least the volume of the filling material contacting the sealing surface of the second body is solidified. Depending on the filling material used, the step of solidifying may be implicit in the step of providing a filling material. That is, if the filling material is e.g. a formable material, such as a wax, it may provide a solid surface on the sealing surface of the second body after filling it into the space without an additional solidifying step. The sealing surface of the second body is removed from the surface to be coated as well as from the surface provided by the filling material. The surface to be coated is coated such that a membrane is provided,

sealing the space. After the described steps, the membrane is suspended over the space, which can be a sensor recess. The coating may particularly be applied through chemical vapor deposition (CVD), atomic layer deposition (ALD), dip-coating or another suitable process.

[0009] In one embodiment of the invention, the filling material is at least partially removed after the coating process. Particularly, it may be completely removed. However, as the sensor may be embedded in the filling material, it may be sufficient to remove only parts of the filling material. Alternatively, the filling material may entirely remain in the space in the receiving body. Particularly, the filling material is removed through dissolving and/ or melting, e. g. by immersion in a deionized water bath at elevated temperature or dissolving by acid or alkaline solutions.

[0010] In one embodiment of the invention, the receiving body encloses a hollow space, in particular a hollow cylinder, of which the interior surface is to be coated.

[0011] The space in the receiving body may be realized by a continuous opening. It may be manufactured through drilling, broaching, electrochemical machining (ECM), and/ or other techniques.

[0012] In another embodiment of the invention, the sealing surface of the second body is positioned by pressing it against the surface to be coated due to a change of the temperature of at least one of the receiving body and the second body and a corresponding expansion or contraction process of the respective body, and/ or due to inflating the second body or parts thereof. In the case of a receiving body that encloses a hollow space, the second body may be a core element of which the cross section is essentially of the same shape and size as the cross section of the hollow space of the receiving body. Different thermal expansion or contraction processes may be used in order to position and interlock the core element inside the hollow space defined by the receiving body, sealing it with the sealing surface of the second body. The outer surface of the core element forms a tight seal with the inner surface of the receiving body, at least in the circumference of the space in the receiving body.

[0013] In one embodiment, the material of the second body has a higher coefficient of thermal expansion (CTE) than the material of the receiving body. The core element is inserted into the hollow space. At least the inserted core is heated to an elevated temperature, which is referred to as interlocking temperature, such that - due to thermal expansion - the core element is interlocked in the hollow space.

[0014] In another embodiment, the core element and the receiving body are heated to achieve interlocking, wherein due to different coefficients of thermal expansion the core element is interlocked in the hollow space.

[0015] Alternatively, the core element or the receiving body including the core element is cooled prior to insertion of the core element into the hollow space. Interlocking then occurs during reheating of the respective body, e. g. to room temperature. An advantage of this embodiment is that the differing thermal expansion coefficients can further be exploited and the requirements for machining tolerances can be lowered. Besides, the interlocking can be realized without heating above room temperature.

[0016] In another embodiment, the coefficient of thermal expansion of the material of the core element is lower than the coefficient of thermal expansion of the receiving body. In this case, the receiving body with or without the core element is cooled to achieve interlocking.

[0017] Alternatively, the receiving body or both, receiving body and core element, is/ are heated prior to insertion of the core element into the hollow space. In this case, interlocking occurs during cooling of the respective body/ bodies.

[0018] In another embodiment, the receiving body is heated prior to insertion of the second body. In this case, interlocking occurs through thermal contraction of the receiving body when cooled down.

[0019] In still another embodiment, the second body may be a hollow, elastic, balloon-like inflatable device that is inflated by exerting a pressure onto the interior of this device and/ or by introducing a fluid into the interior of this device in order to seal the surface to be coated. Prior to inflation, the dimensions of said balloon-like device may be significantly smaller than the hollow space, which enables to reach hollow spaces that are difficult to access due to their geometry. Furthermore, the interlocking becomes temperature independent and thus a greater choice of materials for the filling material is possible.

[0020] However, the present invention is not restricted to only one of the mentioned embodiments, but a shrinking process of the receiving body may be combined with inflation of the inflatable device in order to press the sealing surface of the second body against the surface to be coated.

In a simple embodiment, the sealing surface of the second body may be pressed against the surface to be coated such that a sealing effect is achieved between the receiving body and the second body.

[0021] Prior to positioning the second body, additional coatings or agents could be realized or applied onto the receiving body and/ or the second body to facilitate the positioning of the sealing surface on the surface to be coated, in case of a hollow cylinder to facilitate the insertion and removal of the core element.

[0022] Besides, adhesion promoting coatings could be applied onto the receiving body prior to coating for better adhesion of the membrane. Furthermore, coatings and/ or depositions onto the membrane are possible that enhance or enable additional sensing functionality or improve the structural robustness.

[0023] Particularly, the filling material is inserted into the space in the receiving body in a liquid or paste-like state and is at least partially solidified, namely at the side of the surface to be coated, by cooling or heating and/ or curing. That is, the filling material may be a liquid, paste-

like or powdery medium which is at least partially solidified by cooling down, heating or curing. Particularly, the filling material is a thermoplastic or thermosetting organic substance or a thermoplastic or thermosetting mixture of organic substances, e. g. a wax that is cooled below its melting point. Said wax is given into the space in the receiving body and hardened while the receiving body and the core element are still interlocked, forming a wax surface in the surface to be coated that is flush with the surface to be coated of the receiving body.

[0024] In another embodiment, the filling material may be a thermosetting material, e. g. a synthetic resin, which is cured. Curing may be initiated, accelerated and/ or enhanced through heating, irradiation or addition of chemicals and/ or humidity.

[0025] In another embodiment, the sealing surface of the second body is removed from the surface to be coated as well as from the surface provided by the filling material by contraction of the second body due to reduction of temperature of the second body and/ or pressure reduction in the second body. That is, the volume or cross section of the second body is reduced by thermal contraction and/ or by reduction of pressure or volume of a fluid contained in an inflatable device providing the second body.

[0026] A second aspect of the invention describes a carrying device for reception of at least one sensor, comprising a receiving body with a space provided in the receiving body, wherein said space is suitable to receive at least one sensor. Said space is open on a surface of the receiving body. The carrying device further comprises a membrane that seals said surface of the receiving body at least partially and closes the opening of the space in the surface. Particularly, the carrying device is manufactured with a method according to the first aspect of the invention and/ or at least one of the embodiments described.

One advantage is the seamless integration of the arbitrary shaped membrane suspended over the space according to the invention. The carrying device which may be an enclosure forming a hollow space, e.g. a pipe, tube, etc., may be fabricated in any applicable manner and from any material.

[0027] In one embodiment, the membrane is positioned in such a manner that it is flush with the surface to be coated of the receiving body. Particularly, the membrane thickness is less than 10 μm. The membrane can be made of any material which does not interfere with the measurement principle of the sensor and can be coated as a conformal film onto the surface to be coated. For example, if the analyte's pressure is to be measured, the material's Young's Modulus needs to be low enough to allow enough deflection of the diaphragm, such that the pressure may be transmitted to the sensor.

[0028] In a further embodiment, the membrane essentially covers the whole surface providing the opening of the space of the receiving body. That is, the membrane may totally cover the whole surface providing the opening of the space of the receiving body.

[0029] Particularly, the membrane material is poly(p-xylylene) (Parylene). Parylene is biocompatible such that the medium could be of biological nature (e.g. blood).

[0030] A third aspect of the invention describes a system for detection and/ or measurement of at least one physical parameter and/ or chemical composition of a medium, in particular of a fluid, comprising the carrying device for reception of at least one sensor according to the second aspect of the invention or at least one of the described embodiments and at least one sensor positioned in the space of the receiving body of the carrying device. Particularly, the sensor is fixed in the opening.

[0031] Particularly, when the receiving body of the carrying device of the system for detection and/ or measurement provides a hollow space, a medium in form of a liquid or a gas may be conducted through the hollow space and at least one physical parameter and/ or chemical composition of the medium such as velocity or pressure may be measured.

Detection and/ or measurement of a chemical composition may comprise qualitative and/ or quantitative methods for the detection or measurement of chemical elements and/ or compounds. That is, for example, the presence of a substance may be detected using a qualitative method, or the blood oxygen concentration may be measured using a quantitative method.

[0032] In one embodiment, the system for detection and/ or measurement may be applied onto a body to be able to measure a parameter such as frequency, e. g. a heart rate.

[0033] The sensor may be embedded in filling material contained in the space in the receiving body.

[0034] In another embodiment, sensor and membrane are positioned in a distance to each other. The distance between the sensor and the membrane may at least partially be filled with a coupling medium, which is able to transmit physical parameters such as pressure, oscillations, etc. The membrane is thin and soft, such that its restoration force does not significantly impede the accuracy of or sensitivity of the sensor. Particularly, silicone oil may be used.

[0035] Alternatively, the sensor directly contacts the membrane.

[0036] The claimed system may exemplarily be used for pressure measurements. In this case, the sensor may e.g. be realized as a piezo-resistive microelectromechanical system pressure sensor which is positioned into the space in the carrying device.

[0037] A fourth aspect of the invention describes a method for detection and/ or measurement of at least one physical parameter and/ or chemical composition of a medium, in particular of a fluid, wherein a system for detection and/ or measurement according to the invention is provided. Additionally, the medium, of which at least one physical parameter and/ or chemical composition is to be detected and/ or measured, is provided. The medium is positioned with respect to the system for de-

tection and/ or measurement in such a manner that at least one physical parameter and/ or chemical composition of the medium can be detected and/ or measured by means of the sensor. Subsequently, at least one physical parameter and/ or chemical composition of the medium is detected and/ or measured.

[0038] Also in this aspect, when the receiving body of the carrying device of the system for detection and/ or measurement provides a hollow space, a medium in form of a liquid or a gas may be conducted through the hollow space and at least one physical parameter and/ or chemical composition of the medium such as velocity or pressure may be measured.

In another embodiment of this aspect, the system for detection and/ or measurement may be applied onto a body to measure a parameter such as oscillation frequency, e. g. a heart rate.

[0039] The main advantage of the invention is the manufacturing of a system that allows for the perturbation-free measurement of fluid properties and operating conditions. The possible membrane geometries and properties do not limit its use to a single type of measurement (e.g. pressure). The membrane material and fabrication process may be chosen in such way that biocompatibility is achievable.

With respect to the example of measurement in left ventricular assist devices or blood contacting medical devices in general, the invention avoids physiological side effects, like blood clotting and hemolysis; it avoids drift of functional properties of the sensors.

[0040] The invention is not limited to the alternatives described herein. Furthermore, all described embodiments and alternatives of the invention may be combined.

The invention is further illustrated and characterized by the following figures that show a certain example from which further embodiments and advantages can be drawn. These figures are meant to illustrate the invention but not to limit its scope.

Figures 1a)-d) show procedural steps of a method according to the invention.

Figure 2 shows a perspective view of an inflow cannula of a left ventricular assist device. Figure 1a) shows the cross-section of a carrying device 1. The receiving body 10 is realized as a hollow cylinder 16, so the carrying device 1 has a tubular cross-section, at least in the area presented. In this example, the receiving body 10 may be of steel or titanium. The space 14 is realized as continuous opening 141 in the form of a drill hole, of which the outer part has a bigger diameter than the inner part. The size of the space 14 is predetermined by the size of the sensor 40 that is to be inserted into the continuous opening 141.

The surface to be coated 12 is located on the inside of the hollow cylinder 16. That is, in this example, the entire inner surface of the hollow cylinder 16 is to be coated. A second body 20 is positioned inside the hollow cylinder 16. It comprises a sealing surface 22 on the outside, which is in sealing contact with the surface to be coated 12 of the receiving body 10.

[0041] In this example, the second body is of a material with a higher coefficient of thermal expansion than the material of the first body. The insertion of the second body 20 was carried out at room temperature. Both bodies are manufactured to such tolerances that insertion is feasible at room temperature. Subsequently, the entire assembly, comprising both the receiving body 10 and the second body 20, was heated to a higher temperature, referred to as interlocking temperature, to achieve interlocking of the second body 20 and the receiving body 10. Interlocking is to be achieved in such a way that the surface to be coated 12 is sealed.

[0042] Figure 1b) shows the same cross-section with a filling material 30 positioned in the space 14 of the receiving body 10. The second body 20 is still interlocked with the receiving body 10, as the temperature is still equal or above the interlocking temperature.

The filling material 30 in this example is a wax with a higher melting point than the interlocking temperature. It was filled inside the space 14 and solidified by letting cool to a temperature below its melting point, but above the interlocking temperature. The solidified filling material 30 forms a surface shaped complementary to the sealing surface 22 of the second body 20.

[0043] Figure 1c) shows the same cross-section, where the second body 20 is removed and the surface to be coated 12 is covered with a membrane 50.

[0044] The whole assembly comprising the receiving body 10, the second body 20 and the solidified filling material 30 was cooled to a temperature below the interlocking temperature. Subsequently, the second body 20 was removed. A membrane 50 consisting of Parylene was deposited onto the surface to be coated 12 of the receiving body 10 in a roomtemperature coating process. That is, in this example, the entire inner surface of the hollow cylinder 16 is coated with a Parylene membrane 50 of which the thickness is less than 10 μm.

[0045] Figure 1d) shows the same cross-section, where the filling material 30 is removed. The membrane 50 separates the space 14, i.e. the continuous opening 141, of the receiving body 10 from the hollow cylinder 16. The receiving body 10 is now ready to receive a sensor 40 which is to be inserted into the continuous opening 141. The surface of the membrane 50 is smooth, as it covers the entire inner surface of the receiving body 10. There are no obstructions in the hollow cylinder 16 which could damage or disturb a medium 60 flowing through said hollow cylinder 16. Besides, the sensor 40 is enabled to perform accurate and robust measurements through the thin and transparent Parylene membrane 50.

[0046] Figure 2 shows an inflow cannula 101 of a left ventricular assist device as a receiving body. The membrane 50 is located on the inner surface of the receiving body 10 that forms a hollow cylinder 16. A sensor 40 is positioned in the space 14. The membrane 50 covers the hollow cylinder 16 which is provided by the inflow cannula

101 of the left ventricular assist device and separates the space 14, containing the sensor 40, from the medium 60 that flows through said inflow cannula 101. This example shows the inserted sensor 40 that is enabled to perform accurate and robust measurements through the thin and transparent Parylene membrane 50. Furthermore, as also in this example the membrane 50 covers the entire inner surface of the receiving body 10, no obstructions are present in the hollow cylinder 16 which could damage or disturb the medium 60 that flows through the inflow cannula 101 of the left ventricular assist device. This example enables the measurement of blood pressure and, thus, allows for monitoring the patient's state and for controlling the left ventricular assist device's pumping speed.

List of reference signs

[0047]

1	carrying device
10	receiving body
12	surface to be coated
14	space
16	hollow cylinder
20	second body
22	sealing surface
30	filling material
40	sensor
50	membrane
60	medium
101	left ventricular assist device inflow cannula
141	continuous opening

Claims

1. A method for the manufacturing of a carrying device (1) for reception of at least one sensor (40), comprising the steps of:

- providing a receiving body (10) having a surface to be coated (12) and a space (14) which is open on the side of this surface,
- providing a second body (20) having a sealing surface (22) and positioning the sealing surface (22) of the second body (20) in such a manner that the surface to be coated (12) of the receiving body (10) is sealed by the second body (20) at least in the circumference of the space (14) in the receiving body,
- providing a formable or moldable filling material (30) in the space (14) in such a manner that the filling material (30) forms a surface shaped complementary to the sealing surface (22) of the second body (20) closing the space (14),
- solidifying at least the volume of the filling material (30) contacting the sealing surface (22) of the second body (20),
- removing the sealing surface (22) of the second body (20) from the surface to be coated (12) as well as from the surface provided by the filling material (30),
- coating the surface to be coated (12) such that a membrane (50) is provided sealing the space (14).

2. Method for the manufacturing of a carrying device (1) according to claim 1, wherein the filling material (30) is at least partially removed after the coating process.

3. Method for the manufacturing of a carrying device (1) according to at least one of the claims 1 and 2, wherein the receiving body (10) encloses a hollow space, in particular a hollow cylinder (16).

4. Method for the manufacturing of a carrying device (1) according to at least one of the claims 1-3, wherein the space (14) in the receiving body is realized by a continuous opening (141).

5. Method for the manufacturing of a carrying device (1) according to at least one of the claims 3 and 4, wherein the sealing surface (22) of the second body (20) is positioned by pressing it against the surface to be coated (12) due to a change of the temperature of at least one of the receiving (10) and second body (20) and a corresponding expansion or contraction process of the respective body, and/ or due to inflating the second body (20) or parts thereof.

6. Method for the manufacturing of a carrying device (1) according to at least one of the claims 1-5, wherein the filling material (30) is inserted into the space (14) in the receiving body (10) in a liquid or paste-like state and is at least partially solidified by cooling or heating and/ or curing.

7. Method for the manufacturing of a carrying device (1) according to at least one of the claims 1-6, wherein the sealing surface (22) of the second body (20) is removed from the surface to be coated (12) as well as from the surface provided by the filling material (30) by contraction of the second body (20) due to reduction of temperature of the second body (20) and/ or pressure reduction in the second body (20).

8. Carrying device (1) for reception of at least one sensor (40), preferably manufactured with the method according to at least one of the claims 1-7, comprising a receiving body (10) with a space (14) provided in the receiving body (10), wherein said space (14) is suitable to receive at least one sensor (40), with said space being open on a surface (12) of the receiving body (10), and wherein the carrying device (1) comprises a membrane (50) that seals said sur-

face (12) of the receiving body (10) at least partially and closes the opening of the space (14) in the surface (12).

9. Carrying device (1) for reception of at least one sensor (40) according to claim 8, wherein the membrane thickness is less than 10 micrometers.

10. Carrying device (1) for reception of at least one sensor (40) according to at least one of the claims 8 and 9, wherein the membrane (50) essentially covers the whole surface (12) providing the opening of the space (14) of the receiving body (10).

11. Carrying device (1) for reception of at least one sensor (40) according to at least one of the claims 8-10, wherein the membrane material is poly(p-xylylene).

12. System for detection and/ or measurement of at least one physical parameter and/ or chemical composition of a medium (60), in particular of a fluid, comprising the carrying device (1) for reception of at least one sensor (40) according to at least one of the claims 8-11 and at least one sensor (40) positioned in the space (14) of the receiving body (10) of the carrying device (1).

13. System for detection and/ or measurement according to claim 12, wherein the sensor (40) is embedded in filling material (30) contained in the space (14) in the receiving body (10).

14. System for detection and/ or measurement according to one of the claims 12 or 13, wherein

i) the sensor (40) and the membrane (50) are positioned in a distance to each other, or
ii) the sensor (40) directly contacts the membrane (50).

15. Method for detection and/ or measurement of at least one physical parameter and/ or chemical composition of a medium (60), in particular of a fluid, wherein the method comprises at least the following steps:

i) providing a system for detection and/ or measurement according to at least one of the claims 12 to 14;
ii) providing the medium (60) of which at least one physical parameter and/ or chemical composition is to be detected and/ or measured;
iii) positioning the medium (60) with respect to the system for detection and/ or measurement in such a manner that at least one physical parameter and/ or chemical composition of the medium (60) can be detected by means of the sensor (40); and
iv) detecting and/ or measuring of at least one physical parameter and/ or chemical composition of the medium (60).

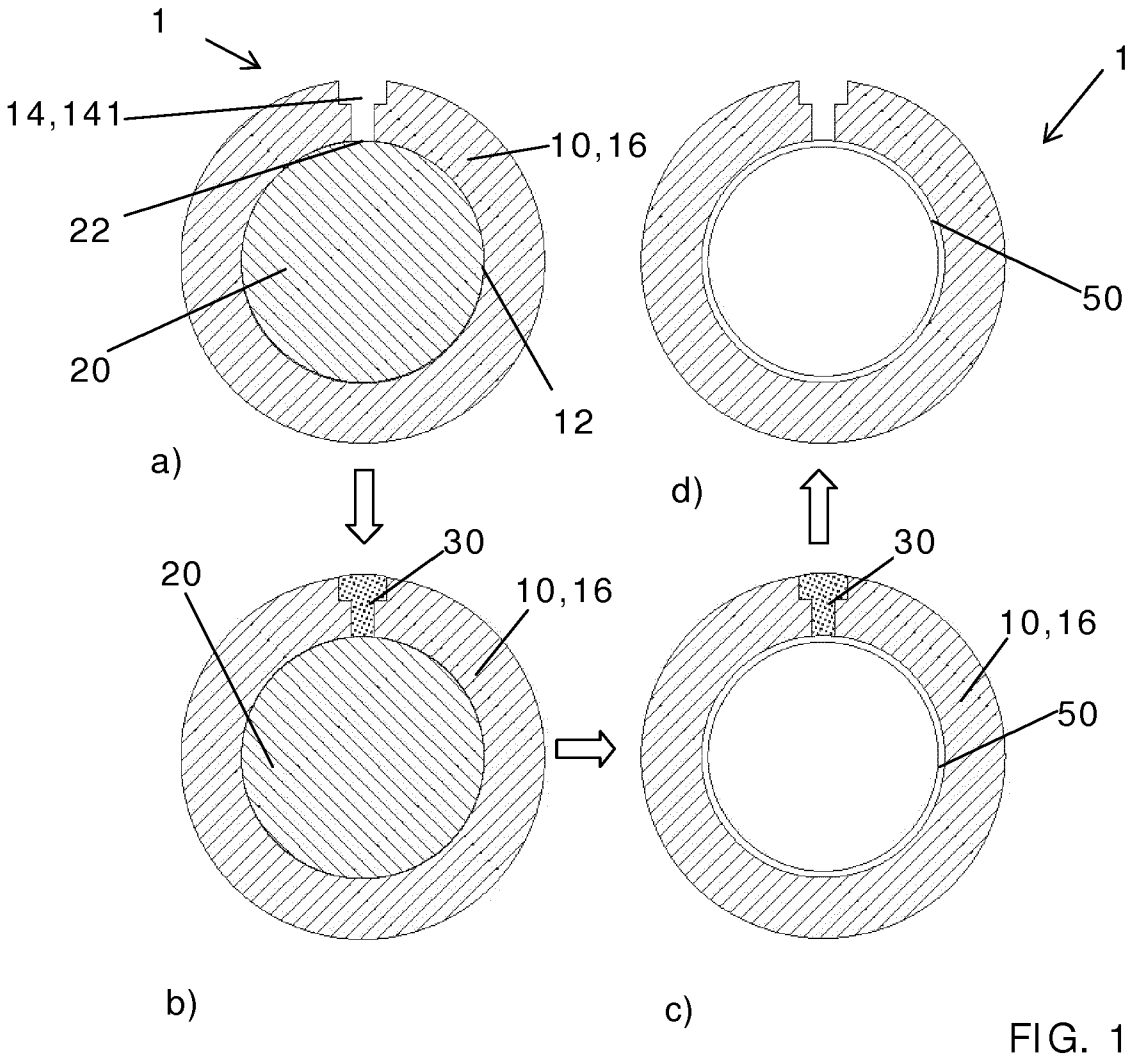

FIG. 1

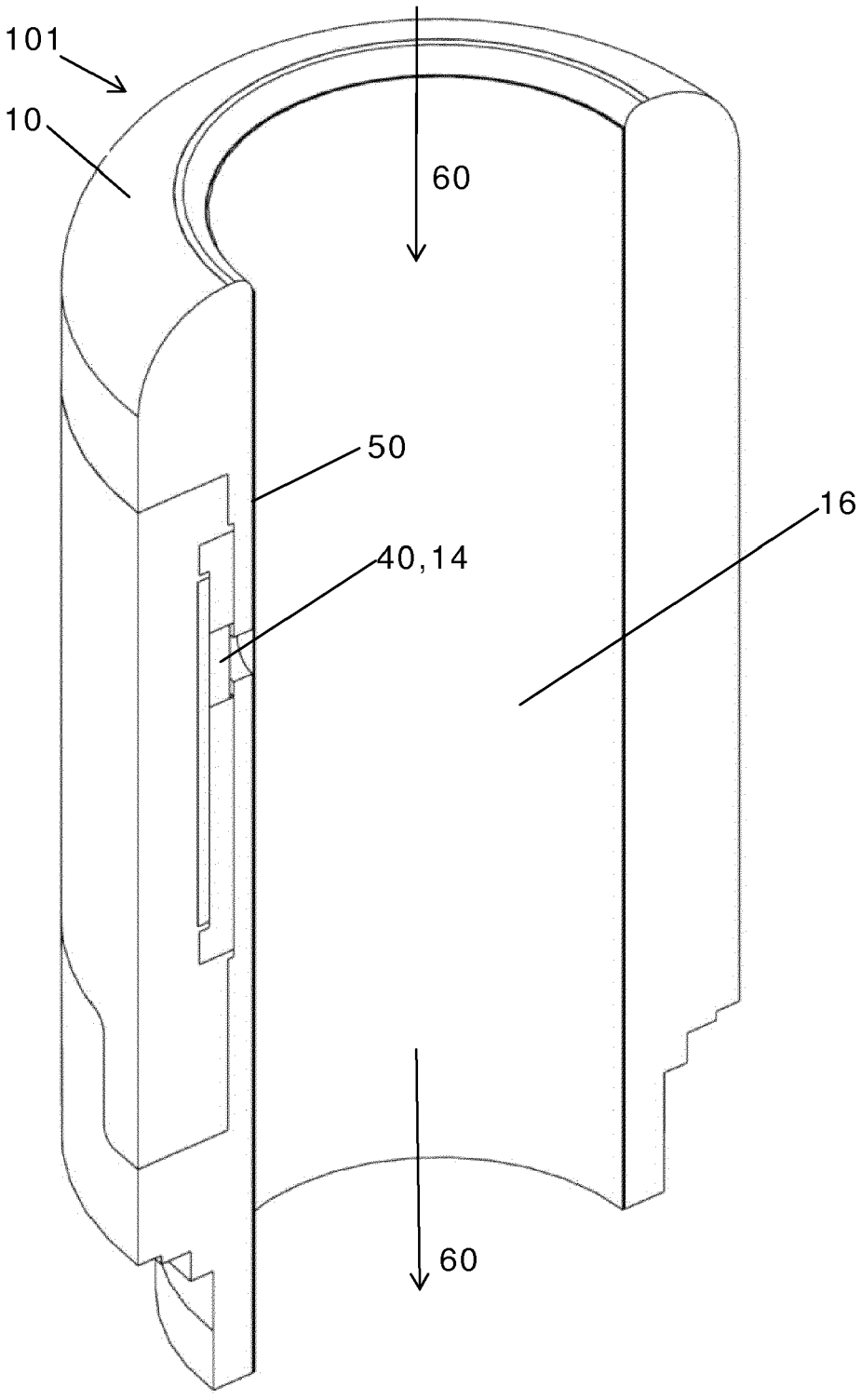

FIG.2

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EUROPEAN SEARCH REPORT

Application Number
EP 16 16 1976

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	WO 00/65984 A1 (APEX MEDICAL INC [US]) 9 November 2000 (2000-11-09) * page 3, line 7 - page 8, line 15; figures 1,7 *	8,10,12, 14,15 9,11	INV. A61B5/00 A61B5/0215 G01L9/00
X	US 2016/029956 A1 (ROWLAND HARRY [US] ET AL) 4 February 2016 (2016-02-04) * paragraphs [0068] - [0082] *	8-10, 12-15	ADD. A61M25/00 A61M1/10
X,D	US 2014/296740 A1 (STEINHILPER KLAUS-DIETER [DE] ET AL) 2 October 2014 (2014-10-02) * paragraphs [0006] - [0016] * * paragraphs [0032] - [0045] *	8-12,14, 15	
Y	WO 2015/126703 A1 (GRAFTWORX LLC [GB]) 27 August 2015 (2015-08-27) * abstract * * paragraph [0086] *	9,11	

TECHNICAL FIELDS SEARCHED (IPC)
A61M A61B G01L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	26 August 2016	Loveniers, Kris

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

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26-08-2016

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专利名称(译)	用于制造承载装置的方法，承载装置，用于检测物理参数的系统和用于检测物理参数的方法		
公开(公告)号	EP3222206A1	公开(公告)日	2017-09-27
申请号	EP2016161976	申请日	2016-03-23
申请(专利权)人(译)	苏黎世联邦理工学院		
当前申请(专利权)人(译)	苏黎世联邦理工学院		
[标]发明人	HIEROLD CHRISTOFER PETERS CHRISTIAN STAUFERT SILVAN		
发明人	HIEROLD, CHRISTOFER PETERS, CHRISTIAN STAUFERT, SILVAN		
IPC分类号	A61B5/00 A61B5/0215 G01L9/00 A61M25/00 A61M1/10		
CPC分类号	A61M1/1086 A61B5/021 A61B5/0215 A61B5/02438 A61B5/14542 A61B5/1473 A61B5/6876 A61B2562/0247 A61B2562/028 A61B2562/12 A61B2562/168 A61B2562/18 A61M1/1012 A61M1/122 A61M2205/3334 A61M2205/3344 A61M2207/00 A61M2230/06 A61M2230/205 G01L19/141		
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摘要(译)

本发明涉及一种用于制造承载装置的方法，一种承载装置，一种用于检测的系统以及一种用于检测至少一种物理参数和/或化学成分的方法。提供了一种用于制造用于接收至少一个传感器的承载装置的方法，其中提供了具有待涂覆表面的接收体。在接收体中，提供了在该表面侧开口的空间。提供具有密封表面的第二主体。该密封表面定位成使得接收体的待涂覆表面至少在接收体中的空间的圆周中由第二体密封。可成形或可模制的填充材料以这样的方式设置在该空间中，使得填充材料形成与第二主体的密封表面互补的形状的表面，从而封闭该空间。至少接触第二主体的密封表面的填充材料的体积是固化的。第二主体的密封表面从待涂覆的表面以及由填充材料提供的表面移除。涂覆的表面被涂覆，使得提供膜，密封空间。

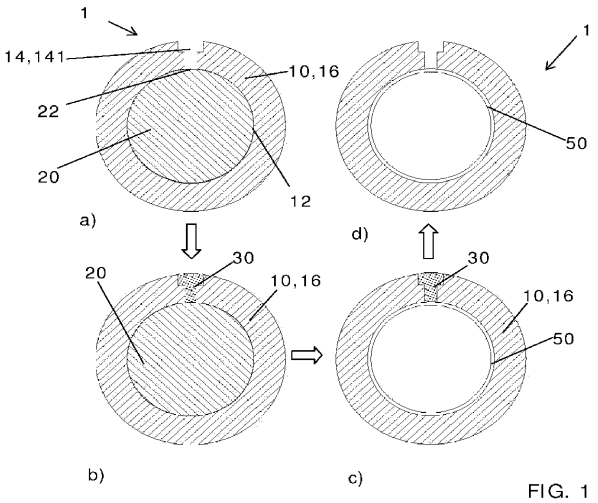

FIG. 1